



# 2012 – 2016 Biosolids Plan

June 2012



**King County**

Department of Natural Resources and Parks  
Wastewater Treatment Division

**Resource Recovery –  
Biosolids Management Program**

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# **Biosolids Plan**

## **2012-2016**



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**Department of Natural Resources and Parks**  
**Wastewater Treatment Division**  
**Resource Recovery - Biosolids Management Program**  
201 South Jackson Street, KSC-NR-0512  
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Dryland wheat In Eastern Washington grown with King County biosolids.

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# Executive Summary

## Revisiting Assumptions: Good Business Practice

The King County Biosolids Program has a strong history as a national leader in biosolids management. Over the course of 40 years, the program has served as a front runner in the field of biosolids recycling. As noted in this plan, a tenet of the program has been to regularly reevaluate assumptions related to the most appropriate future strategy for the management of biosolids. In this report, we earnestly challenge our assumptions and explore new ideas while remaining grounded in rigorous science.

An analysis of alternative uses and market opportunities for biosolids was completed in 2009. This analysis provided cost/benefit information for land application, composting, and alternative energy production. This process affirmed that our best approach is to focus on land application and composting of biosolids, the most cost-effective and reliable options at this time.

This plan provides a roadmap to expand our existing base of support and guide the Wastewater Treatment Division (WTD) through changes in the soil amendment industry.

## Market-Based Approach within a Utility Setting

Biosolids are a safe, sustainable alternative to synthetic fertilizer. Unlike synthetic fertilizer, which requires a large amount of energy to manufacture, biosolids production creates methane gas, which is captured and used as renewable fuel. As a soil amendment, biosolids are an incredible source of nutrients and are highly regulated –especially in Washington State. In a world where carbon, nitrogen, phosphorous and other nutrients are in limited supply and where we are working to limit our carbon footprint, the land application of biosolids is the smart, environmental choice.

*Through this planning process we have reaffirmed our commitment to biosolids as a soil amendment, an endlessly renewable resource that restores carbon and nutrients to the land for the good of people, plants and Puget Sound.*

In the coming years, we plan to capitalize on the unique attributes of our biosolids soil amendment through more focused communications and marketing. Our objective is to actively cultivate and increase community support and understanding of the County's biosolids product and correct misinformation about the safety and environmental benefits of biosolids. Our intent is to generate interest, "deepen our well" of community goodwill about our product, and communicate our agency's values, its public promise, and reliability –what customers can count on when they use our product.

This plan charts a path for our ratepayers that minimizes cost and risk, while remaining aligned with overall county policies and plans. As with other WTD utility plans, our biosolids management direction is designed to dovetail with WTD's business needs and its commitment to global stewardship and regulatory compliance.

## Drivers for Planning

Two major drivers led the King County biosolids program to begin formal planning for biosolids management (Section 1.4).

- In August 2009, the King County Council, via Council Motion 13043, accepted a report and analysis from WTD on alternative uses of biosolids (see summary in Section 4 of this document). As a follow up to this report, WTD continued to evaluate biosolids options and develop a plan for the next five years.
- The Washington State Auditor's Office (SAO) recommended King County develop a long-term biosolids strategic plan to define specific goals related to the sales of biosolids, with the intent of expanding the market and increasing the price customers would be willing to pay for biosolids. This recommendation was a result of a 2009 performance audit intended to identify cost savings, revenue-generating opportunities, and efficiencies that could reduce rates or postpone future rate increases.

*Regional biosolids markets were in flux: dryland wheat remained strong while composters struggled with the economic downturn and reduced demand.*

*Internal to our program, unexpected staffing changes were both a hurdle and an opportunity.*

### A Time of Change: 2009 - 2011

From 2009 through 2011, regional biosolids markets and customers were in flux: a primary market—dryland wheat—remained strong, while composting facilities struggled with the economic downturn and reduced demand for compost. Other agriculture and forestry customers began shifting out of long-established crops and land management methods into new ones. The west coast's primary biosolids-to-energy vendor struggled with the operation of their first full-scale facility.

Budget reductions and austerity measures within the utility led us to bring the drafting of this strategic plan in-house rather than relying on consultants.

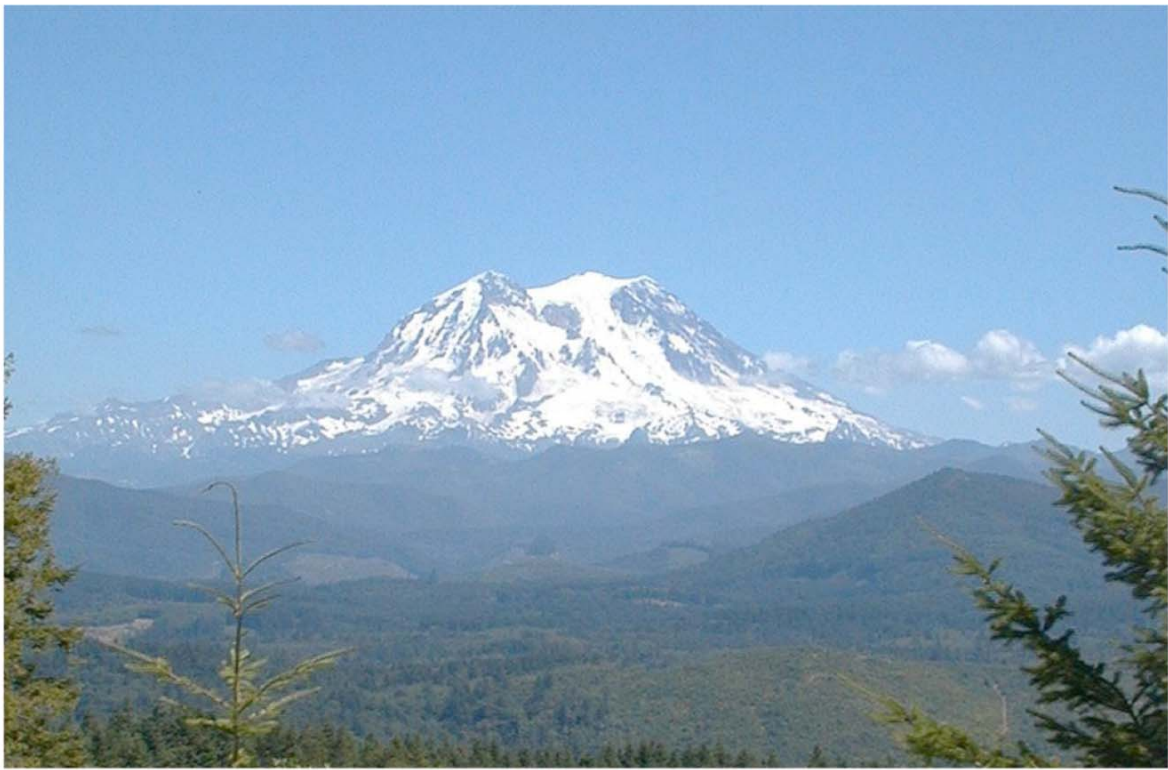
Between 2009 and 2011, after decades of stable staffing, we had turnover within our partner organizations and our WTD biosolids team. Internally to our program, staffing changes gave us an opportunity to clearly define our needs, retool, retrain and rebuild our team with the skill sets needed to implement this plan.

### Looking to the Future: 2012 and Beyond

By the end of 2011, markets and staffing stabilized and WTD is now defining a sustainable course for the biosolids program's next five years. To maintain strength and reliability of a land-based program, WTD will need to nurture existing markets, diversify the program with new customers, and keep evaluating emerging technologies. Specifically, challenges and opportunities that WTD is gearing up to face over the next five years include:

- Strengthening existing markets by providing a consistent quality biosolids, predictable deliveries, and technical support
- Establishing backup and storage options so that the program can manage inclement weather and other disruptions of product flow

- Continuing to evaluate the current method of transportation (trucking) in light of increasing energy costs and geographic distribution of customers
- Building public trust in King County biosolids and setting it apart from competitors through branding and strategic messaging
- Continuing university-level research to support highest quality operations, maximize resource value from biosolids, provide public information, and evaluate new markets
- Exploring new partnerships that provide geographic diversity and sustainable business relationships
- Evaluating emerging or maturing technologies for potential testing



View from University of Washington's Center for Sustainable Forestry at Pack Forest, site of early research with King County biosolids.

# 1.0 Introduction

Strategic planning involves evaluating the present and charting a path into the imagined future. To map a strategy to move forward, an organization needs to have a vision of its preferred future and then determine what steps will be necessary to reach it. The most successful strategic plans involve people at every level and function of the organization who know what steps or actions need to be taken and their role in those actions.

By preparing and publishing this plan, the Wastewater Treatment Division is:

- Describing its vision for producing and marketing biosolids over the next 5 years
- Identifying the actions that will be necessary to create this vision
- Promoting a common understanding among staff and management on strategies and long- and short-term priorities
- Establishing goals, objectives and performance measures to increase accountability
- Reinforcing our commitment to the highest quality biosolids product we can make

King County and its predecessor agency have been producing and recycling biosolids since the early 1970s. When other utilities were discarding wastewater solids into water bodies or landfilling, the county was working with universities and the private sector to grow trees, restore soils, and make compost. Planning for the future of the program is not a new or unfamiliar process. But many factors in today's world—rising energy prices, encroaching urbanization, climate change, and warp-speed communications via digital networks—are compelling us to re-evaluate our long-term plans.

## 1.1 Pioneers in Biosolids Recycling

Although not the first wastewater utility to find beneficial uses for its sewage sludge, the Municipality of Metropolitan Seattle (Metro) was one of the utilities that ceased discharging solids in response to the federal Clean Water Act of 1972. Metro adopted a sludge reuse policy and began funding the University of Washington College of Forest Resources to research the use of sludge as a forest fertilizer. Over the next fifteen years, Metro worked with many landowners to use its product to fertilize forests, make compost, grow cover crops on landfills, restore gravel pits and coal mines, and grow turf in many landscapes. By 1988, when the federal Environmental Protection Agency (EPA) began an award program for wastewater utilities, Metro was the obvious choice to take first place in the Best Operating Sludge Management Program category.

Locally, Metro's diverse and active program began to stall after two highly visible failures to work successfully with neighbors of proposed large-scale biosolids forestry projects in Thurston County and southern King County. While our commitment to the environmental benefit of biosolids application was unwavering, concerns and conflicts with neighbors allowed Metro to see the potential volatility of the industry and need to integrate good-neighbor principles into the core business practice of the biosolids program.

At the same time on the national front, significant positive changes were under way. Metro's Sludge Manager led a nationwide campaign to refer to treated sludge as "biosolids." When the EPA published the federal rule in 1993, backed by decades of field research, it endorsed the term biosolids.

Also in the early 1990s, farmers in eastern and central Washington, unable to obtain enough biosolids from local treatment plants, approached Metro as a potential ongoing supplier. After the first field demonstrations, the demand for biosolids from wheat farmers and hops growers escalated.

Farmers using biosolids became community spokespersons and formed their own companies to obtain, distribute, and manage the land application of biosolids. Metro, now King County, began to focus on building large capacity, community-supported agriculture projects in Yakima and Douglas counties.

## **1.2 Market-Based Strategy & Guiding Principles**

In response to experiences of the early 1990s, WTD reevaluated assumptions related to the most appropriate future strategy for managing biosolids.

In 1994, a team of consultants helped WTD management identify the fundamental questions: "What kinds of products do biosolids customers want, and how can we design and build a cost-effective facility to produce those products?"

The division's consultants concluded that a market-based approach to biosolids management could provide stability for the program. Developing and relying on markets for biosolids reuse meant a new way of doing business for WTD. The consultant team proposed the concept of the treatment plants as factories that make products for markets and customers. They identified the following guiding principles that the biosolids program needed to follow:

1. Pay attention to the customer; develop long-term customer partnerships.
2. Develop a solid program for quality control and continual improvement of the product.
3. Provide ongoing research and development into new product and market potential.
4. Perform frequent, objective evaluations to check for customer satisfaction, market strength, and new market opportunities.
5. Establish and participate in long-range market planning to develop sustained, steady growth.

## **1.3 Policy and Process Decisions for RWSP**

During the two years of strategic planning between 1994 and 1995, several policy questions were raised and brought to wastewater management and an internal stakeholder team for decisions. They were later endorsed by the King County Executive in his preferred Regional Wastewater Services Plan (RWSP) for 1996-2030. These decisions shaped the current biosolids program.

### **Produce Class B or Class A Biosolids?**

The division decided to continue producing Class B biosolids, but to explore technology that could enable the county to make Class A biosolids cost-effectively or to increase their marketability. The County Council affirmed this decision to continue to produce Class B biosolids when it endorsed the biosolids policies in the Regional Wastewater Services Plan in 1999. These policies also reemphasized that "future decisions about technology, transportation and distribution shall be based on marketability of biosolids products."

This decision was reaffirmed in 2005, when WTD and consultants analyzed the potential Class A technology options available in order to inform decisions if certain business conditions or trigger events made the production of Class A biosolids necessary. The most likely option for producing Class A biosolids at WTD's plants would require higher heat and longer digestion times.

The final report - a *Class A Implementation Work Plan* - outlines the steps needed to install TPAD (temperature-phased anaerobic digestion) at both plants only if the need for Class A is triggered (Brown & Caldwell 2005). At the time of the report, it would have cost just under \$40 million dollars to upgrade West Point Treatment Plant and \$32 million dollars to upgrade South Plant to thermophilic processes capable of producing Class A biosolids.

#### **Pursue biosolids drying options?**

Because WTD was beginning its contract in 1996 with private firm PCL/SMI to conduct a demonstration project to create a dried product from West Point solids, the division decided not to pursue further drying capability at the time.

In 1997, then-County Executive Ron Sims terminated the PCL/SMI contract, after a study requested by the King County Council concluded that drying was not a reliable replacement for West Point's digestion technology. The county retained mesophilic anaerobic digestion as its primary solids processing technology.

#### **Expand compost production?**

Difficulties in determining the true capacity of the local marketplace left this question unresolved at the time of the 1995 strategic planning process.

#### **Pursue biosolids incineration?**

This option was fully explored in the market research phase of the 1995 strategic plan. The division determined that they would not pursue incineration at that time. However, there was an interest in continuing to explore alternative technologies that could reduce the volume of biosolids produced.

#### **Degree of privatization?**

The division decided that the current program was a good hybrid of both privatization and public sector oversight. Each opportunity for increased privatization would be considered individually.

The final report from this strategic planning process was titled *Biosolids Long-Range Strategy and Facilities Plan, 1995*. The analyses and discussions from this process led to the development of new biosolids policies, which were adopted by the King County Council in the RWSP in 1999. See Section 3.2.3 of this document for a complete list of the county's biosolids policies.

## **1.4 Updating the 1995 Strategic Plan**

In late 2008, the Washington State Auditor's Office (SAO) selected King County's Wastewater Treatment and Solid Waste divisions for a performance audit. The purpose of the audit was to identify cost savings, revenue-generating opportunities, and efficiencies that could reduce rates or postpone future rate increases. The SAO recommended that King County develop a long-term biosolids strategic plan that would define the specific goals related to the sales of biosolids, with the intent of expanding the market and increasing the price customers would be willing to pay for biosolids. The county concurred with the recommendation for an updated strategic plan and confirmed that SMART (specific, measurable, attainable, relevant, and time-bound) goals and performance measures for the biosolids program would be established in annual business plans.

In August 2009, the King County Council, via Council Motion 13043, accepted a report and analysis from WTD on alternative uses of biosolids (see summary in Section 4 of this document). As a follow up to this report, WTD continued to evaluate biosolids options and plan for the next five years. The Council directed WTD to analyze opportunities to work

with other wastewater treatment agencies and opportunities for beneficial uses that may be coordinated with other King County utilities and agencies.

The Council also directed WTD to continue with its existing biosolids program and to assess the following:

- **Retail compost:** establish a new composting contract for a small portion of the county's biosolids during the winter months—if it resulted in lower costs to ratepayers—and evaluate potential methane emissions
- **Land reclamation:** plan and implement a gravel mine or similar land reclamation project and conduct other research and demonstration projects that test carbon sequestration methodology
- **Biofuel production:** seek other opportunities to develop or participate in pilot projects to utilize biosolids directly as an energy source or biofuel

WTD made progress establishing a new composting contract and a land reclamation demonstration project and assessing opportunities for biofuel production partnerships. However, funds for full-scale strategic planning and stakeholder consultation were among the projects eliminated in the 2010 budget process in order to keep the sewer rate at an acceptable level. To satisfy King County Council and SAO recommendations for a long-term plan, WTD continued with a planning effort that included interviews with internal and external stakeholders and a cross-divisional management workshop. That process, plus further evaluation of future business opportunities for the WTD Biosolids Program, resulted in the production of this document.



Harvesting wheat from a biosolids-amended field in Douglas County, Washington.

## 2.0 Existing Business Conditions: Biosolids Production and Distribution

### 2.1 Biosolids Production by Plant

Since 1996, the amount of solids produced at WTD's treatment plants has been fairly consistent. The graphs illustrate that all solids were processed solely at West Point until 1987, when South Plant began producing biosolids.

WTD tracks both "wet tons" and "dry tons" of biosolids. Biosolids are produced as wet tons, a unit of measurement that includes the weight of water plus the solids. A dry ton is the calculated weight of the solids only. The downward trend in the wet tons shown in Figure 1 from 1998 to 2008 can be attributed to the installation of high-speed centrifuges at West Point and South Plant. Current annual total wet ton production is about 120,000 tons with a system-wide solids average of 25 percent solids.

No significant increases in the total biosolids production are expected for the near future. In 2012, about 10 percent of the system's influent flows will be diverted to Brightwater, which also produces biosolids.

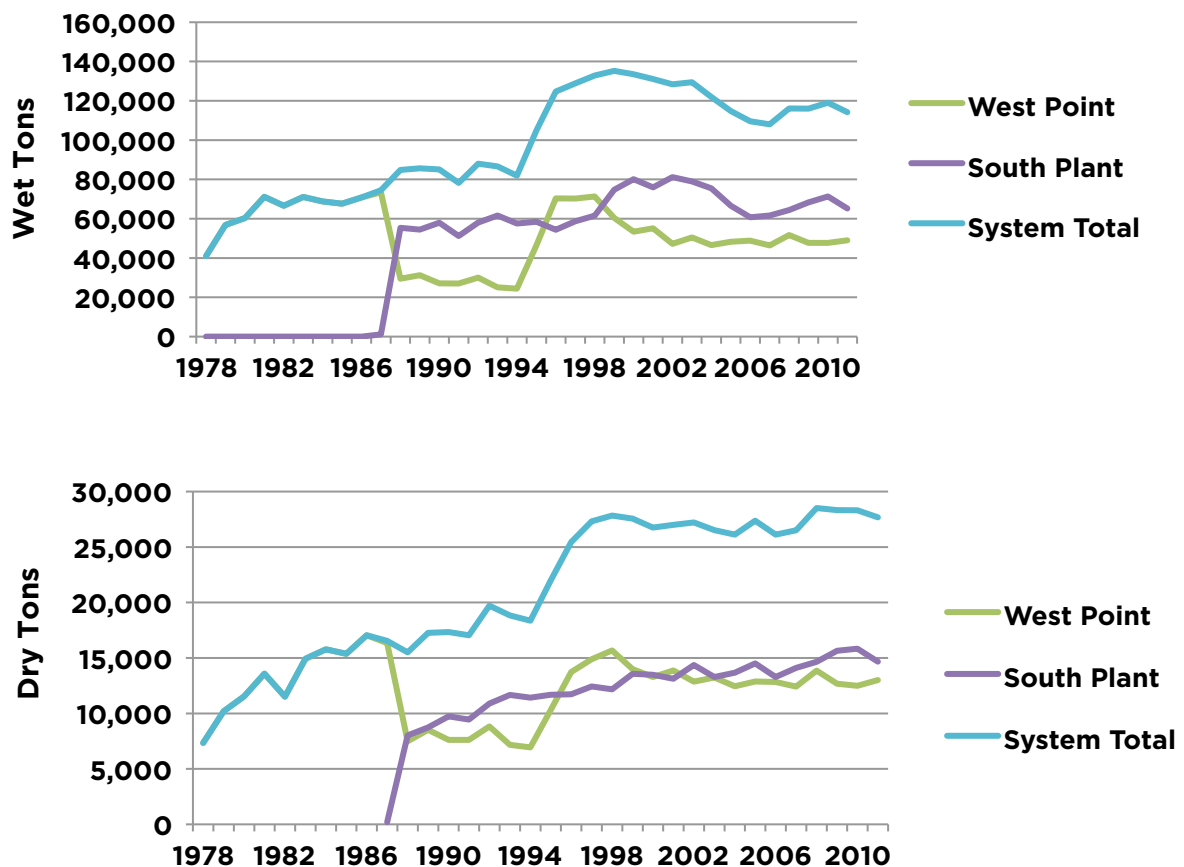


Figure 1. Biosolids Produced by WTD, 1978-2010

## 2.2 Current Biosolids Distribution and Customers

WTD biosolids are used as a fertilizer and soil amendment on farms and forests. Longtime agriculture customers in Eastern Washington reap a variety of benefits from using biosolids.

University studies show that crop yields with biosolids are equal to or higher than yields from synthetic fertilizer, due to biosolids nutrients and organic matter. In the forest, biosolids increase timber yields and make understory plants grow thick and lush, creating food and habitat for wildlife.

Presently, the largest market for King County biosolids is in Douglas and Yakima counties, where farmer-owned companies receive and manage the application of biosolids on their own farmland and the fields of their neighbors. In Douglas County, there is more demand for biosolids fertilizer than what is available from WTD and other generators. These locally controlled biosolids programs have been stable and reliable for more than 15 years. However, the location of this market requires biosolids deliveries across the mountain passes year-round. Rising fuel costs and temporary closures of mountain passes can affect the program.

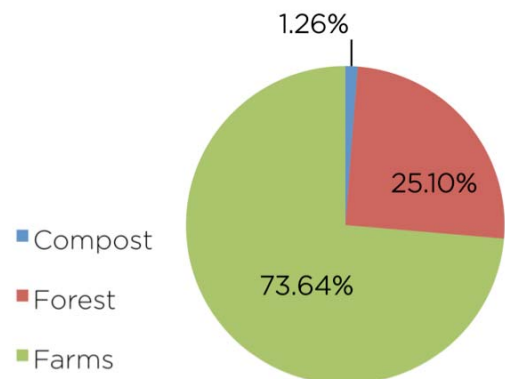
WTD's biosolids are also land-applied to commercial forests in King County, and a relatively small amount is used in a retail compost. Current forestry and compost partners have a limited capacity to receive and use biosolids.

A few times each year, when winter storms cause closure of mountain highways and passes, the county's compost partner, GroCo, accepts as much biosolids as possible, but their receiving and storage capacity is limited. King County has an agreement with the City of Everett for seven days of emergency storage on a large asphalt pad adjacent to their wastewater treatment lagoons. Biosolids delivered to Everett during inclement weather are reloaded and transported over the passes as soon as weather and road conditions permit.

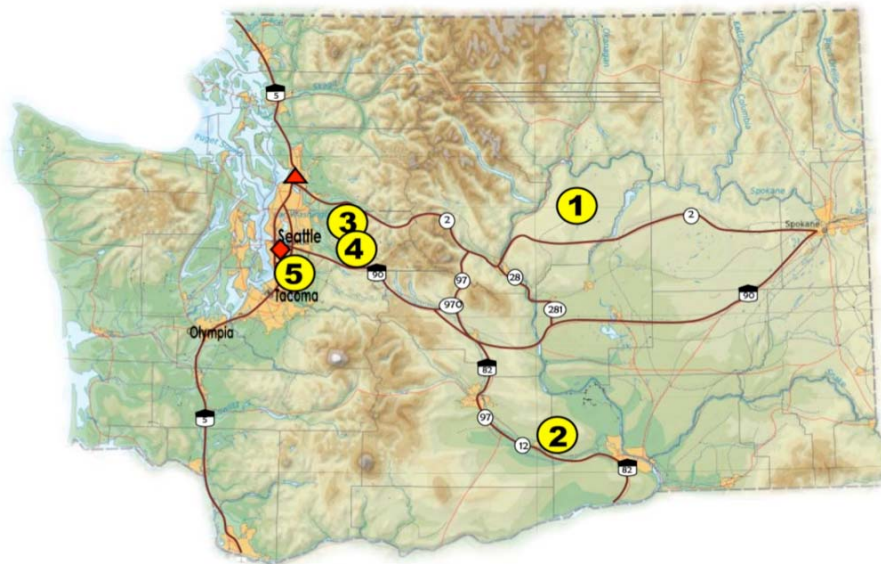
*King County WTD recycles wastewater solids into approximately 120,000 tons of biosolids soil amendment annually.*

*Presently, the largest market for WTD biosolids is in Douglas and Yakima counties, where farmer-owned companies receive biosolids and apply it to their fields and the fields of their neighbors.*

*This market requires biosolids deliveries across mountain passes year round.*



**Figure 2. Biosolids Distribution, 2011**



**Figure 3. King County Biosolids Customers, 2011**

Project Name	Landowner	Uses/ Crops	County	Tons	% of Total	Est. Future Demand
1. Boulder Park	Various	Dryland wheat	Douglas	68,000	57.1%	↑
2. Natural Selection Farms	Various	Canola, hops	Yakima	20,000	16.8%	↓
3. Snoqualmie Forest	Hancock Forest Management	Commercial forests	King	25,000	21.0%	?
4. Marckworth Forest	WA State DNR	Commercial forests	King	5,000	4.2%	?
5. GroCo Compost	GroCo Inc.	Retail compost	King	1,500	0.8%	▬
<b>Total Annual Production</b>				<b>119,500</b>	<b>100%</b>	

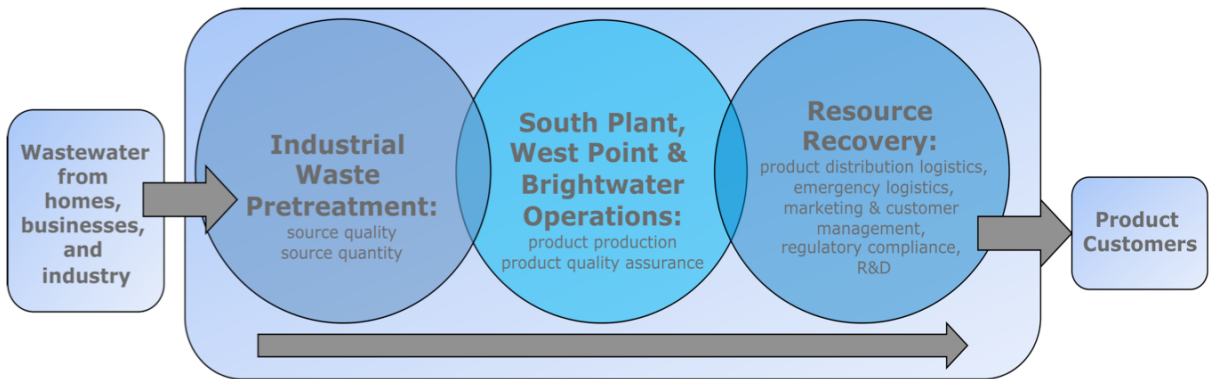
Figures are approximate; annual tonnage and distribution vary slightly based on annual production and market conditions

▲	Temporary storage at City of Everett Water Pollution Control Facility
◆	Georgetown Yard, truck maintenance facility at KC International Airport
↑ ↓	Customer demand for biosolids increasing/decreasing
?	Future demand is unknown
▬	Future demand is not expected to grow in the near term

**Table 1. Customers of King County Biosolids, 2011**

## 2.3 Biosolids Supply Chain

The business of resource recovery involves a sequence of events that begins with (1) raw material ‘suppliers’ who discharge wastewater into the conveyance system, then (2) processing, treatment, and production at treatment plants, (3) delivery of products to markets, and (4) customer support. This sequence has also been called the biosolids *value chain* because each of the major elements within WTD—the Industrial Waste Pretreatment Program, the conveyance and treatment plant operations, and the Resource Recovery team—affect the quality and add value to the final product.



**Figure 4. Supply Chain for WTD's Clean Water Factories**

As in other manufacturing processes, supplier and source control is essential to the quality of the finished product. WTD's Industrial Waste Program regulates industrial discharges, preventing substances from entering the wastewater that could damage the processes at the treatment plants, harm workers, or degrade the quality of effluent, reclaimed water, and biosolids.

At the plants, operations personnel manage the treatment process. Incoming wastewater is screened, subjected to biological treatment, disinfected, and released to Puget Sound or used as reclaimed water. The solids that were extracted from the wastewater are collected and pumped into large tanks for biological digestion. Under elevated temperatures and in the absence of oxygen, beneficial microbes (bacteria and other microscopic organisms) break down and consume a large portion of the solids. A major product of this microbial activity is methane gas, which is recovered and used as an energy source to help operate the plant.

The process of digestion destroys nearly all (90-95 percent) of the disease-causing organisms that may have been present in the undigested solids. After several weeks of digestion, the solids satisfy federal and state regulatory requirements and meet the legal definition of "biosolids." The biosolids are then thickened by centrifuging and loaded into trucks for delivery to customers.

Coordinating closely with treatment plant operations personnel, the Biosolids Management Program and its hauling contractor transport and distribute the biosolids to several customer groups. The Biosolids Program is responsible for overseeing all final uses of biosolids, as well as customer service, regulatory compliance, marketing and public information, coordination with other jurisdictions, demonstration projects, and research.

*Product quality is dependent on performance and collaboration along the entire value chain.* Some goals and objectives found later in this plan will refer to desired improvements along the chain.

## **3.0 Biosolids Program Drivers – Regulatory and Legislative Direction**

Since 1973, King County's biosolids program has developed a strong, established track record of working in compliance with national and state regulations. At all levels of government, there is consistency and agreement that biosolids are a valuable commodity. King County's biosolids policies, enacted by ordinance in 1999, went beyond the simple concept of beneficial use and established the marketability of biosolids as the basis for future decisions about technology and distribution. More recently, the County reaffirmed its priorities on environmental enhancement in the update of its Comprehensive Plan and the 2010-2014 Strategic Plan. This biosolids five-year plan is closely aligned with these countywide plans.

### **3.1 Applicable National & State Regulations**

Biosolids are made in compliance with U.S. Environmental Protection Agency (EPA) standards and are regularly tested for quality and safety. Monitoring and long-term research demonstrates that biosolids are a safe and effective soil amendment. Biosolids are tested for trace metals and pathogens to ensure safety for both the environment and human health. King County's biosolids always test well below the metals limit for EPA Exceptional Quality biosolids.

At the national level, biosolids are regulated under the Federal Clean Water Act (CWA). In accordance with the CWA, the EPA published 40 CFR Part 503, which contains the primary technical regulations for biosolids management, including biosolids quality criteria and site management standards. The federal program is self-implementing. This means that even in the absence of a permit, regulated facilities must comply with applicable portions of the regulation. WTD must submit a permit application concurrent with NPDES permit renewal every five years.

Washington State also has authority for regulating biosolids. Chapter 70.95J RCW, recognizes biosolids as a valuable commodity and directs the Washington State Department of Ecology (Ecology) to implement a program that maximizes beneficial use. The state program is stricter than federal minimum requirements, and Ecology is authorized to issue permits and to collect fees for permits. Ecology published Chapter 173-308 WAC, Biosolids Management, in the spring of 1998 and revised the rule in the summer of 2007. Like federal rules, the state rules are self-implementing.

State rules define beneficial use of biosolids as: application to land for the purposes of improving soil characteristics including tilth, fertility, and stability, and enhancing the growth of vegetation consistent with protecting human health and the environment. At this time, Washington State does not recognize combustion of biosolids for energy as a beneficial use. The state does not allow landfilling of biosolids except as an emergency practice.

Federal and state rules recognize two classes of biosolids: *Class A* and *Class B*. Class A biosolids have a high level of treatment and essentially contain no pathogenic organisms. They can be distributed as a retail product to the general public and used with no restrictions. Class A biosolids can be made from Class B biosolids through processes to

further reduce pathogens such as composting, heat drying, beta ray irradiation, gamma ray irradiation, pasteurization and thermophilic digestion.

Class B biosolids are the predominant class of biosolids produced in the US. They are treated to significantly reduce pathogens. WTD's Class B biosolids are produced through mesophilic anaerobic digestion that removes the majority of the pathogenic organisms. The remainder of the organisms die off during transport or after land application. To ensure the same level of safety for both classes of biosolids, federal and state rules require varying lengths of access restrictions to application sites and crop harvest restrictions for Class B.

When biosolids meet Class A standards and also meet the numerical standards for regulated metals, they are designated as Exceptional Quality (EQ) and have virtually unrestricted use. King County's treatment plants produce Class B biosolids that meet the strictest numerical standards for metals. A small portion of this production is composted to make GroCo, which is a Class A, Exceptional Quality biosolids product.

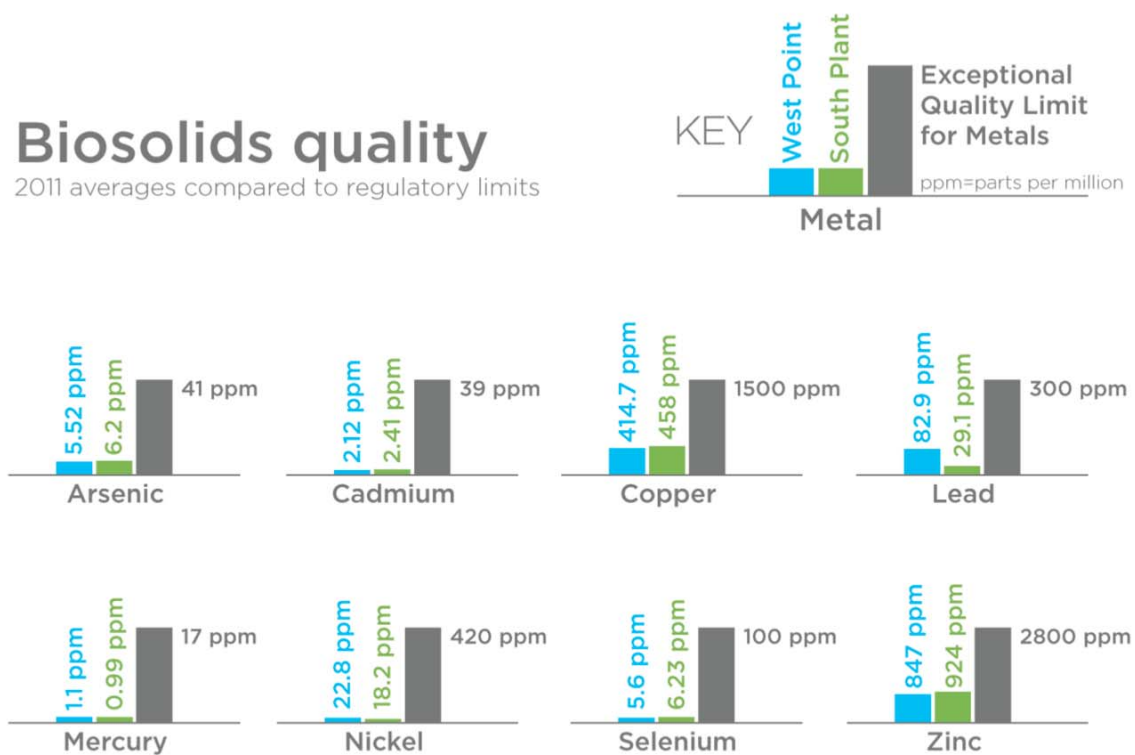


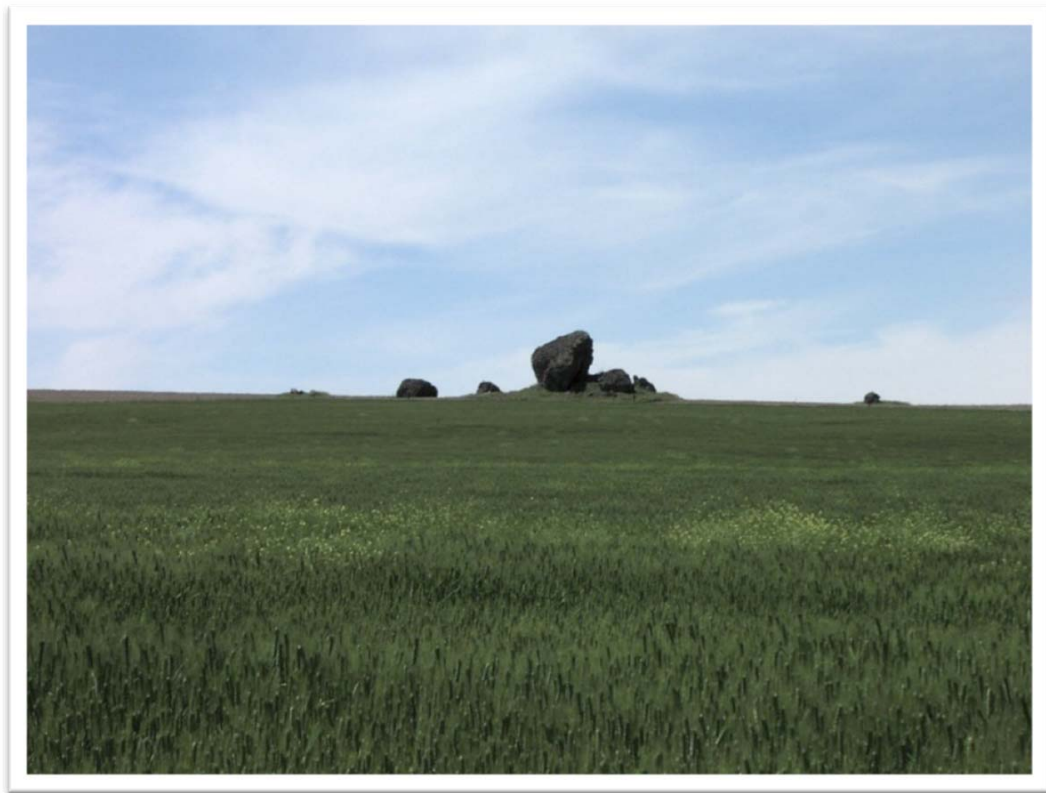
Figure 5. King County Biosolids Quality, 2011

Land application of Class B biosolids, on the other hand, requires a state-approved Site-Specific Land Application Plan that includes the following elements:

- Crops to be grown and their intended use
- Calculation of agronomic application rates
- Method and timing of applications
- Monitoring data for soil, surface water or ground water
- Description of biosolids storage
- Description of public access restrictions
- Site maps
- Past applications of biosolids

During the treatment and manufacturing of King County's biosolids, 95 percent or more of the pathogens are destroyed. Any remaining pathogens are eliminated during composting or die off when exposed to light, air, and soil at application sites. Public access and grazing are restricted at WTD biosolids sites for 30 days while this natural die-off takes place. Because composting destroys 100 percent of pathogens, no restrictions are needed when using a Class A compost product.

Every utility that produces biosolids in the State of Washington is required to apply for coverage under the state's General Permit. The rules also include a category for a receiving-only facility or Beneficial Use Facility (BUF). King County currently delivers biosolids to two Beneficial Use Facilities in eastern Washington: Boulder Park and Natural Selection Farms.



Dryland wheat fields at the Boulder Park Project, a farmer-owned and managed Beneficial Use Facility in Douglas County, WA, that uses WTD biosolids.

## 3.2 County Policies That Influence Biosolids Management

### 3.2.1 The King County Comprehensive Plan

The King County Comprehensive Plan, updated in 2010, details county policies for protection of land, air, and water and reflects increased emphasis on climate change, monitoring, and adaptive management. Because using biosolids can reduce greenhouse gas emissions, improve soils and crops, and restore ecological function, it's not surprising that WTD's biosolids management strategies and tactics are compatible with many of King County's environmental policies and programs. The use of biosolids can play a key role in these particular areas:

- Low Impact Development
- Agriculture
- Forestry
- Land Reclamation
- Soils and Organics
- Climate Change & Carbon Sequestration

The county policies that influence our direction for biosolids management are outlined in the King County Comprehensive Plan and summarized in the table below.

King County Comprehensive Plan 2010	
Low Impact Development	
E-419	Stormwater runoff shall be managed through a variety of methods, with the goal of limiting impacts to aquatic resources, reducing the risk of flooding, protecting and enhancing the viability of agricultural lands and promoting groundwater recharge.
R-336	King County shall work with residential builders and developers to encourage the use of low impact development practices that protect native vegetation and soils, restore disturbed soils, and reduce impervious surfaces.
Agriculture	
R-517	King County should explore ways of creating and supporting community gardens, farmers' markets, produce stands and other similar community based food growing projects to provide and improve access to healthy food for all rural residents.
R-603	King County should work with other counties to help maintain and enhance commercial agriculture and forestry by addressing challenges common across the region
R-657	King County shall continue to support innovative initiatives, such as the Puget Sound Fresh and Farm Link Programs, to promote and enhance agriculture in King County.
R-674	King County should promote local food production and processing to reduce the distance that food must travel from farm to table.
Forestry	
R-612	King County shall work cooperatively with cities, tribes, other public agencies, private utilities, resource managers, land owners and citizens to conserve public and private Resource Lands for long-term productivity and environmental protection in a consistent and predictable manner.
R-622	King County recognizes the many values provided by the public forestland in the county and encourages continued responsible forest management on these lands. King County should collaborate with other public land managers in planning for the conservation, use, and management of forest resources on public lands.
R-635	King County promotes forest management that achieves long-term forest health; protection of watersheds, critical areas and habitat to support fish and wildlife populations; protection of threatened and endangered species; conservation and economic viability of working forests; carbon sequestration and reduction in green house gas emissions; and adaptation to climate change.
R-637	King County shall encourage the development of private/public partnerships that provide incentives for landowners to practice innovative, fish-friendly forestry and that can help ensure retention of the forest resource land base in perpetuity.
R-638	King County encourages the use of recycled, organic-based soil amendments and fertilizers in forest ecosystems, which can reduce erosion and sedimentation into streams,

increase water-holding capacity of soils, stimulate the growth of trees and other vegetation and enhance fish and wildlife habitat. King County shall work with the general public and private and public forestland owners to encourage the selective and appropriate use of these materials for ecosystem enhancement and restoration.

#### **Land Reclamation**

R-688 King County should work with the State Department of Natural Resources to ensure that mining areas are reclaimed in a timely and appropriate manner. Reclamation of mining sites in the Forest Production District should return the land to forestry.

#### **Climate Change and Carbon Sequestration**

E-205 King County shall maximize the creation of resources from waste products from county operations, such as gases produced by wastewater treatment and solid waste disposal, in a manner that reduces GHG emissions and produces renewable energy.

E-218 King County should participate in carbon markets, and in doing so, should help to develop effective carbon emissions accounting methodologies that recognize the unique emissions profiles of local and regional governments. King County should partner with other governments, institutions and organizations on further development of effective and efficient rules for emissions trading.

#### **Soils and Organics**

E-426 King County should implement programs to improve availability and markets for organic materials for soils that have been disturbed by new and existing developments.

E-427 King County shall regard the region's organic waste materials as resources which should be reused as much as possible, and minimize the disposal of such materials.

E-428 King County shall identify long-term options for expanding the organic waste material processing capacity in the county in order to provide alternatives for management of manure, food waste, and wood, and to increase the availability of organic soil amendments.

E-429 King County shall promote, encourage, and require, where appropriate, the beneficial use of organic materials, including but not limited to their use in the following activities: agriculture and silviculture; road, park and other public project development; site development and new construction; restoration and remediation of disturbed soils; nursery and sod production; and landscaping.

E-430 King County agencies shall use recycled organic products, such as compost, whenever feasible and promote the application of organic material to compensate for historic losses of organic content in soil caused by development, agricultural practices, and resource extraction.

E-431 King County will seek to enhance soil quality, and protect water quality and biodiversity across the landscape by developing policies, programs, and incentives that support the goal of no net loss of organic material.

E-432 King County should explore ways to beneficially use biosolids, whenever feasible, locally.

**Table 2. Drivers for Strategies - King County Comprehensive Plan, 2010**



Volunteers at an Alleycat Acres urban farm in Seattle, where all produce is grown with compost made from King County biosolids.

### 3.2.2 How Biosolids Management Aligns with Countywide Strategic Plan Goals

In 2009, King County Executive Dow Constantine directed the Office of Strategic Planning and Performance Management to collect input from residents, elected officials, employees, regional cities and communities about their desired direction for the County over the next five years. The result was the King County Strategic Plan. WTD's current biosolids activities and its future plans are closely aligned with the County's overall strategies.

Consistent with our vision and mission, WTD produces internal and external products as part of our business implementation. Biosolids are included as one WTD's "final products" that represent the core of high-level services provided to our customers.

Product:	Customer:
<b>Transfer and Delivery of Wastewater for Treatment</b>	WTD Component Agencies – sewer districts, cities, tribes who deliver wastewater into King County wastewater system
<b>Clean Effluent for Discharge</b>	End users of water, ratepayers, component agencies, residents of Puget Sound
<b>Creation of Public Infrastructure</b>	End users of water, ratepayers, component agencies, residents of Puget Sound
<b>Reclaimed Water (for non-potable use)</b>	Internal & external customers (nurseries, irrigators, street cleaners, etc.)
<b>Biosolids</b>	Farmers, foresters, and landscapers
<b>Energy (harvested from wastewater processes)</b>	Internal & external customers (Puget Sound Energy, Seattle City Light, etc.)
<b>Educational Information and facility tours</b>	Members of the public that receive education about water quality and public health protection

Table 3. WTD Products and Customers

#### Legend:

✓	= Marginally Advances
✓✓	= Significantly Advances

#### Strategic Plan Goal: Health and Human Potential

Strategic Plan Objective:	Strategic Plan Strategy:	WTD Products:						
		WW Treatment	Clean Effluent	Public Infrastructure	Reclaimed Water	Biosolids	Energy	Info
2. Protect the health of communities	2a. Ensure safety of food, air, water 2c. Monitor and improve environ. quality and reduce exposure to hazardous materials	✓✓	✓✓	✓	✓	✓		

#### Strategic Plan Goal: Economic Growth and Built Environment

Strategic Plan Objective:	Strategic Plan Strategy:	WTD Products:						
		WW Treatment	Clean Effluent	Public Infrastructure	Reclaimed Water	Biosolids	Energy	Info
1. Support a strong, diverse, and sustainable economy	1a. Promote regional economic development via partnerships with regional organizations, other jurisdictions, and the private sector	✓✓	✓✓	✓✓	✓	✓✓	✓	

4. Preserve the unique character of our rural communities in collaboration with rural residents	<p>4b. Encourage stewardship of rural landscapes including agricultural and forest land</p> <p>4c. Promote policies and programs that sustain rural lifestyles</p> <p>4d. Support rural economic development that maintains the character of the rural area</p>				✓✓	✓✓		
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### Strategic Plan Goal: Environmental Sustainability

Strategic Plan Objective:	Strategic Plan Strategy:	WTD Products:						
		WW Treatment	Clean Effluent	Public Infrastructure	Reclaimed Water	Biosolids	Energy	Info
1. Protect and restore water quality, biodiversity, open space, and ecosystems	<p>7b. Use a combination of incentives, tech assistance, and regulations to promote desirable environmental practices by individuals and businesses</p> <p>7c. Support acquisition and stewardship of open space and natural areas</p> <p>7d. Protect water quality through reducing pollution at its source, wastewater treatment, low impact development practices, and storm water management</p> <p>7e. Collaborate to restore Puget Sound and protect vulnerable, threatened, and endangered species</p> <p>7f. Use water quality and quantity monitoring data to inform and prioritize investments in clean-ups and storm water retrofits</p>	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓
2. Encourage sustainable agriculture and forestry	<p>2a. Utilize landowner incentives to keep land in agricultural/ forestry use</p> <p>2b. Provide incentives, tech assistance, and streamlined permitting to support sustainable farm and forestry practices</p>				✓✓	✓✓		✓

3. Reduce climate pollution and prepare for the effects of climate change on the environment, human health, and the economy	<p>3a. Promote collaborative efforts among local and regional governments to assess and reduce community greenhouse gas emissions</p> <p>3b. Monitor county greenhouse gas emissions and use the information to guide future actions and investments to advance progress with emission reduction goals</p> <p>3c. Advocate for and participate in the development of federal, state, and regional climate response strategies and resources that advance emission reduction goals</p> <p>3d. Identify and adapt to the impacts of climate change on natural systems, human health, public safety, county operations, infrastructure &amp; economy</p> <p>3e. Advance policies and programs that simultaneously reduce climate pollution and improve health</p>	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓
4. Minimize King County's operational environmental footprint	<p>4a. Incorporate sustainable development practices into the design, construction and operation of county facilities and county-funded projects</p> <p>4b. Measure energy usage in county facilities and use this information to guide conversation investments</p> <p>4c. Invest in alternative fuel transit and fleet vehicles to reduce emissions, fuel use, and fuel costs</p> <p>4d. Create resources from wastewater and solid waste disposal</p> <p>4e. Encourage King County employees to reduce their environmental impact</p>	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓	✓

Table 4. Drivers for Strategies - King County Strategic Plan, 2010-2014

### 3.2.3 King County Biosolids Policies

In 1999, through the RWSP, the county articulated its biosolids policies to guide future uses of biosolids. King County Council adopted these policies with Ordinance No. 13680 and codified them in K.C.C. 28.86.090. These policies can accommodate a variety of future beneficial options. In recognition of biosolids as a valuable commodity, the county established the policy of using marketability as the basis for future decisions about technology, transportation and distribution.

Key policies include maintaining a diverse program with reserve capacity, working cooperatively with statewide organizations, and using local sponsors whenever biosolids are used outside King County.

King County Biosolids Policies	
BP-1	King County shall strive to achieve beneficial use of wastewater solids. A beneficial use can be any use that proves to be environmentally safe, economically sound, and utilizes the advantageous qualities of the material.
BP-2	Biosolids-derived products shall be used as a soil amendment in landscaping projects funded by King County.
BP-3	King County shall consider new and innovative technologies for wastewater solids processing, energy recovery, and beneficial uses brought forward by public or private interests. King County shall seek to advance the beneficial use of wastewater solids, effluent, and methane gas through research and demonstration projects.
BP-4	King County shall seek to maximize program reliability and minimize risk by one or more of the following: (1) maintaining reserve capacity to manage approximately 150 percent of projected volume of biosolids; (2) considering diverse technologies, end products, and beneficial uses; or (3) pursuing contractual protections including interlocal agreements, where appropriate.
BP-5	King County shall produce and use wastewater solids in accordance with federal, state and local regulations.
BP-6	King County shall strive to produce the highest quality biosolids economically and practically achievable and shall continue efforts to reduce trace metals in biosolids consistent with 40 CFR 503 pollutant concentration levels (exceptional quality) for individual metals. The county shall continue to provide Class B biosolids and also to explore technologies that may enable the county to generate Class A biosolids cost-effectively or because they have better marketability. Future decisions about technology, transportation and distribution shall be based on marketability of biosolids products.
BP-7	When biosolids-derived products are distributed outside the wastewater service area, the county shall require that local sponsors using the products secure any permits required by the local government body.
BP-8	King County shall work cooperatively with statewide organizations on biosolids issues.
BP-9	King County shall seek to minimize the noise and odor impact associated with processing, transporting and applying of biosolids, consistent with constraints of economic and environmental considerations and giving due regard to neighboring communities.
BP-10	Where cost-effective, King County shall beneficially use methane produced at the treatment plants for energy and other purposes.

**Table 5. Regional Wastewater Services Plan, Biosolids Policies**

### 3.2.4 Department and Division Goals, Mission, and Vision

WTD is also guided by the department-wide goals of the Department of Natural Resources and Parks (DNRP) and by its own division mission, vision, and goals.

#### **DNRP Goals**

**Environment:** *Minimize waste and emissions, maximize resource reuse and recovery, and protect and restore habitats and ecology functions.*

**People and Communities:** *Protect and improve human health, safety, and wellness – minimum hazards (including toxic exposures and flood risk), maximize opportunities for community building and fitness, build internal capacity for excellence in service delivery.*

**Fiscal Responsibility and Economic Vitality:** *Support King County's economic development goals and ensure ratepayer value through effective, efficient, and equitable program implementation.*

WTD integrates its mission (see center of Figure 6 below) into daily business practices, maximizing the beneficial use of biogas, biosolids, and clean water. The Biosolids Program has a strong alignment with the vision of *Creating Resources from Wastewater*, marketing them and ensuring they are used appropriately and with maximum beneficial effect.

A Balanced Scorecard performance measurement tool is used to track the progress of implementing key initiatives tied to WTD's mission. Our Balanced Scorecard ensures that program decisions balance people management, financial performance, key business processes and customers.



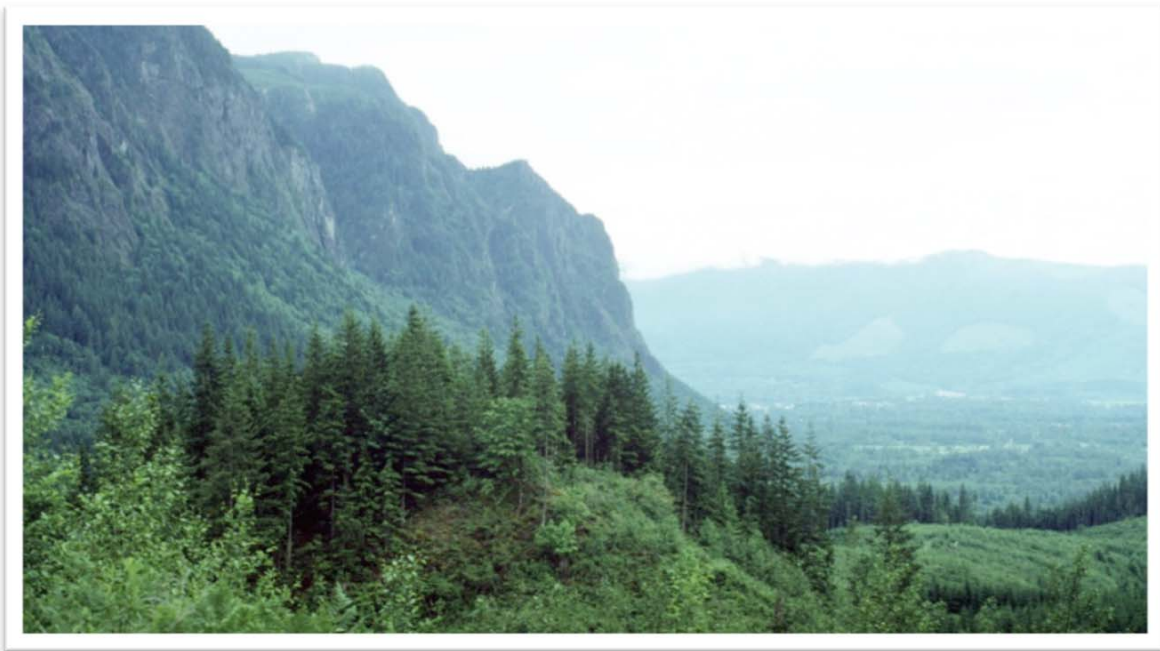
Figure 6. King County WTD's Balanced Scorecard

## 4.0 Market Conditions and Alternatives

Through its regional and national professional network and memberships, WTD has kept up to date with various biosolids management options and technologies. By 2004, there was intense interest among clean water utilities in carbon accounting and the energy potential of biosolids. With a two-part article in BioCycle magazine that year, King County became one of the first utilities to have a published accounting of the greenhouse gas emissions and carbon storage generated by its biosolids program. Within the next few years, the County saw an increase in queries from energy technology vendors. During the same time period, diesel prices were steadily rising and there were more frequent winter closures of the primary haul routes to Eastern Washington customers.

The combination of these factors—increased interest from vendors, rising energy prices, and awareness of the value of carbon—led the county to issue a Request for Information (RFI) in July 2008 on new markets and beneficial uses for its biosolids. Historically, the strongest market for biosolids in Washington has been east of the Cascades, where the county's biosolids are used as a soil amendment and fertilizer for a variety of crops. With its RFI, the county looked to supplement, strength, or diversify its existing markets.

The RFI sought information on options that could: (1) avoid or manage the impacts of winter weather on biosolids transportation; or (2) reduce the amount of diesel fuel used for transportation; or (3) use biosolids as a tool to reduce emissions of greenhouse gases (i.e., through substitution of biosolids directly for fossil fuels, as a replacement for fertilizers made with fossil fuels, by composting, by direct carbon sequestration, or other methods).



Mountains to Sound Greenway corridor, where managers of public and private forests are using biosolids to enhance tree growth.

## 4.1 Findings: Market Opportunities and Challenges

The types of beneficial uses represented in the Request For Information (RFI) responses included composting, land application, reclamation of disturbed sites, and drying/combustion of a biosolids fuel product for energy.

Appendix A contains the report *Alternative Uses and Market Opportunities for Biosolids, 2009*, which is WTD's analysis of the responses to the RFI. A summary of the findings by beneficial use follows here.

Proposals	Costs	Advantages	Disadvantages
<b>ENERGY</b> Two respondents to the RFI proposed processes to convert biosolids to a biofuel to sell to local industries such as cement manufacturers, for co-combustion with coal.	Fees \$55 and \$95 (est.) per wet ton, not including transportation. Location of the facility could reduce transportation, capital costs, and WTD operating costs.	<ul style="list-style-type: none"> <li>Local use</li> <li>Mitigates air emissions for coal-burning industry</li> <li>Regional option for other local utilities</li> <li>Long-term contracting (20-25 years)</li> <li>1-2 weeks of biosolids storage</li> <li>May generate carbon credits</li> </ul>	<ul style="list-style-type: none"> <li>Requires all WTD biosolids produced and would eliminate current customers</li> <li>Difficult to back up with land-based options</li> <li>High processing fees</li> <li>History of risk with first-time technologies</li> <li>Rated low on daily flexibility and risk</li> <li>Unknown on community support</li> <li>Proposers unable to establish operations in this region or had startup problems at California plant</li> </ul>
<b>COMPOSTING</b> Composting generates carbon benefits and gives the public access to high-quality Class A biosolids products for their lawns, landscaping, and vegetable gardens.	Fees \$40 and \$64 (est.) per wet ton, not including transportation.	<ul style="list-style-type: none"> <li>Local use</li> <li>Storage during inclement weather and backup capacity</li> <li>Flexibility in amount of biosolids required by the facility</li> <li>Successful biosolids compost in region for 35 years</li> <li>Environmental benefits for product users</li> <li>Positive carbon value</li> <li>User-friendly product, public support opportunity</li> </ul>	<ul style="list-style-type: none"> <li>Uncertain size and strength of the compost market.</li> <li>Higher cost than land application</li> </ul>
<b>AGRICULTURE</b> Biosolids used as fertilizer and soil amendment on agricultural crops can increase yields, increase soil organic matter, retain	Fees \$12-14 per wet ton, not including transportation.	<ul style="list-style-type: none"> <li>Successful option for 20 years</li> <li>Outstanding environmental and compliance record</li> <li>Rated highly in all the evaluation criteria</li> <li>Strong market</li> </ul>	<ul style="list-style-type: none"> <li>Distance 200+ miles</li> <li>Fuel price affect program costs</li> <li>Vulnerable to occasional mountain highway pass closures (requires 100% use/storage in western</li> </ul>

moisture and reduce wind erosion. Eastern Washington is WTD's primary market for biosolids. Agricultural areas in King County are limited.		<p>demand</p> <ul style="list-style-type: none"> <li>• Community support</li> <li>• Environmental and economic benefits for customers</li> <li>• Low operating and capital costs</li> <li>• Large storage capacities</li> <li>• Positive carbon value: debits minimal, credits high</li> <li>• Low risk</li> </ul>	<p>Washington for short periods)</p> <ul style="list-style-type: none"> <li>• Other counties outside Douglas and Yakima are difficult to permit</li> </ul>
<p><b>FORESTRY</b></p> <p>WTD biosolids are used to fertilize local public and private forests through a partnership with Mountains to Sound Greenway Trust, Hancock Forest Management, the State Dept. of Natural Resources, and the UW.</p>	<p>Fees \$13 per wet ton not including transportation. Capital costs \$4 per wet ton.</p>	<ul style="list-style-type: none"> <li>• Provides local element to the program, improves diversity</li> <li>• Year-round application sites</li> <li>• Successful option for more than 35 years</li> <li>• Operating and capital costs low</li> <li>• Positive carbon value: debits minimal, credits high</li> <li>• Environmental and economic benefits for customers, wood crops, soil, and wildlife</li> </ul>	<ul style="list-style-type: none"> <li>• Changes in forest management practices can reduce need for biosolids</li> <li>• Unlikely to generate tradable carbon credits</li> <li>• Contributes no storage capacity</li> <li>• Expansion opportunities limited</li> </ul>
<p><b>LAND RECLAMATION</b></p> <p>Biosolids combined with a carbon-rich material, such as woody waste, can be added to the soil to reclaim and restore lands damaged through past activities such as mining of sand, gravel, or minerals.</p>	<p>No cost estimates or specific locations were provided. Estimated to be comparable to or less than current forestry project costs.</p>	<ul style="list-style-type: none"> <li>• Successful in many parts of the country (including Pacific Northwest and British Columbia)</li> <li>• Multiple environmental benefits</li> <li>• Verifiable carbon credits</li> <li>• Option for cost savings and collaboration among county departments and divisions through combined use of KC organic residuals</li> </ul>	<ul style="list-style-type: none"> <li>• Not likely to be on-going, daily program; will be individual project opportunities</li> <li>• Up-front research and demonstration is necessary</li> </ul>

**Table 6. Alternative Uses and Market Opportunities for Biosolids, 2009**

## 4.2 Carbon Accounting for Biosolids Options

Carbon is the primary ingredient in organic matter, and biosolids contain large amounts of organic matter. Biosolids can store carbon in the soil while reducing our carbon footprint. Adding biosolids to soil reduces greenhouse gas emissions in three major ways:

- University studies have shown that adding biosolids to agricultural soils can increase soil carbon concentrations for decades. This keeps some of the earth's carbon out of the atmosphere (where it would be in the form of carbon dioxide CO<sub>2</sub>) and buries it in a huge reservoir—the soil. This process is called carbon sequestration and is an approach to mitigating some of the problems associated with climate change.
- Adding biosolids to soil makes plants grow bigger faster, which means more plants can take more carbon out of the atmosphere via photosynthesis. These plants not only store carbon in their tissues, but eventually they'll drop leaves and stems on the soil surface, adding even more organic matter and carbon to the soil.
- When gardeners and commercial growers use biosolids, they are usually replacing a synthetic fertilizer. Manufacturing synthetic fertilizer requires large amounts of fossil fuel. In contrast, the production of King County biosolids is a source of energy. During the anaerobic digestion of solids at the county's treatment plants, methane biogas is produced. It can be captured and used instead of natural gas or electricity. Using biosolids avoids the greenhouse gas emissions associated with synthetic fertilizers and instead supports a renewable energy source.

Carbon accounting—determining greenhouse gas (GHG) credits and debits for a particular practice—was performed by Dr. Sally Brown of the University of Washington for each of the biosolids management alternatives in the 2009 RFI. She used values from peer-reviewed literature, data collected from King County biosolids application sites, and default values from the Intergovernmental Panel on Climate Change (IPCC). See Appendix A for the full report. In this accounting, the use of the word “credit” is a generic term for the reduction or offset of greenhouse gas emissions.

Carbon credits calculated for the use of biosolids were:

- Replacing synthetic fertilizers
- Accumulating soil carbon
- Replacing fossil fuels
- Displacing traditional materials in cement manufacturing

Carbon debits calculated for the use of biosolids were:

- Burning diesel to transport biosolids from treatment plant to end use
- Burning diesel to land apply biosolids
- Using energy to dry biosolids
- Emitting nitrous oxide (N<sub>2</sub>O) gas

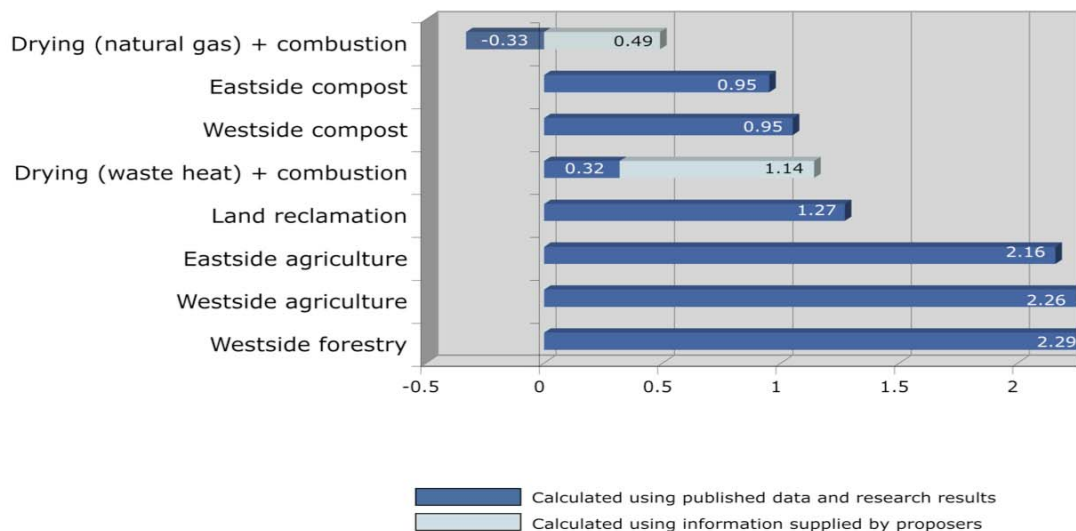
*Debits for transportation of biosolids, even to sites 200 miles distant, were minimal when compared to credits for fertilizer replacement and soil carbon storage.*

*This is counter to popular opinion, which usually focuses only on the debits from diesel-powered trucking and not the larger credits from biosolids land application.*

No debits were taken for methane emissions for any end use options. The likelihood of methane emissions from land application or composting sites is minimal whenever anaerobic conditions are avoided. A survey of the literature also showed that nitrous oxide

(N<sub>2</sub>O) from land application of biosolids was significantly lower than emissions from equivalent rates of nitrogen fertilizers.

All market alternatives reviewed, with the exception of drying with natural gas, showed a positive carbon balance, demonstrating that they all represented beneficial uses. Carbon accounting also showed that debits for truck transportation of biosolids, even to sites that were 200 miles distant, were minimal when compared to credits for fertilizer replacement and soil carbon storage.



**Figure 7. Metric Tons of Carbon Dioxide Stored Per Ton of Biosolids**

## 4.3 Findings and Recommended Next Steps

### 4.3.1 Findings

A major finding from the RFI was that technologies and practices are available to capture all the many benefits that biosolids can provide, including:

- An energy source and replacement for fossil fuels
- A fertilizer and soil-builder for crops
- A tool to restore disturbed or devastated sites
- A tool to reduce carbon dioxide and other greenhouse gases in the atmosphere

Currently, the county's wastewater treatment and biosolids management processes take advantage of all four of these benefits. The division captures a significant amount of energy in the wastewater treatment process by producing biogas in anaerobic digesters at the treatment plants. The county's biosolids program focuses on land application and composting that provide fertilizer and soil building benefits, as well as atmospheric carbon reduction by storing (sequestering) carbon in the soil.

Another finding of the RFI was that the soil nutrient and carbon options met key evaluation criteria better than drying and combustion. While using dried biosolids as a fuel can be beneficial, particularly where land application is not possible, this process appears to have

more risks, be less reliable, have greater overall costs, and does not provide greater carbon benefits. Energy technologies may be ideal solutions for utilities without land-based options. They may be more suited as regional options for multiple utilities. Energy/biofuel scenarios are not desirable for WTD at this time.

The best biosolids management options are those that fit local conditions and circumstances. Washington State is fortunate to have a well-established regulatory program and an effective network of universities, municipalities, and communities that support and benefit from land-based uses of biosolids. An overall analysis of the options from the RFI suggested that the current program, emphasizing sustainable use of carbon and nutrients, should be continued. Financial analysis also showed that the current program was equal to or less expensive than other options, benefiting utility ratepayers.

### **4.3.2 Next Steps**

The RFI revealed that the county has not fully developed opportunities for reclaiming disturbed sites. This is a common use of biosolids products in other states and provinces, particularly in British Columbia. Land reclamation projects can provide local benefits and diversify biosolids programs. In 2010, WTD joined other divisions and departments to plan a reclamation pilot project at Island Center Forest on Vashon Island. This project provided an opportunity to measure carbon sequestration and nitrous oxide emissions and test operational techniques. It led the way for future demonstration projects and highlighted the need to develop techniques for successfully restoring a variety of disturbed sites.

Another next step after the RFI was a Request for Proposals for composting services. Only one vendor, GroCo, Inc., responded to this RFP. They offered a reduced price from their existing contract with the county.

The RFI and subsequent discussions with vendors have provided WTD with the information needed to plan the next five years. Despite interest from technology vendors in a biosolids fuel product, this is a more expensive and less reliable route than using biosolids carbon and nutrients as a soil amendment. Since the RFI, one major energy vendor (EnerTech in Rialto, California) has struggled to bring its technology into reliable operation. Other vendors have left the market or focused on further testing of biosolids. Although land application has its detractors, WTD's primary customers continue to see benefits from biosolids, demand is strong, and research continues to demonstrate environmental enhancement and safety. This path provides WTD ratepayers with the least cost and the least risk, while remaining aligned with overall county policies and plans.

To maintain strength and reliability of a land-based program, WTD will need to nurture existing markets, diversify the program with new markets, and keep evaluating emerging technologies. Specifically, here are some of the key areas that need to be addressed:

- Strengthening existing markets in agriculture, forestry, and compost by providing a consistent quality biosolids, predictable deliveries, and technical support
- Establishing backup and storage options so that the program manages both inclement weather and the occasional off-spec product
- Building public trust in King County biosolids and setting it apart from competitors through branding and strategic messaging
- Continuing research to support highest quality operations, maximize resource value from biosolids, provide public information, and evaluate new markets
- Exploring new partnerships that provide geographic diversity and sustainable business relationships
- Evaluating emerging or maturing technologies for potential testing

## 5.0 Biosolids Program Business Goals and Objectives

Moving forward, it will be important for WTD to keep up to date on new technologies and to continually evaluate its biosolids program for changing market conditions and to ensure its program maximizes the overall benefits to citizens and the environment. As outlined in section 4.3.2, WTD will need to focus strategies in the areas of Business Needs, Global Stewardship, and Regulatory Compliance.

### 5.1 Biosolids Management Business Needs

High-level goals common to all WTD resources are outlined in the left column of Table 7 below. In this plan, **strategic goals**, listed in right column of the table below, are outcome statements that define what WTD's Biosolids Program is trying to accomplish over the next five years. **Objectives** are more precise, measurable, and support the achievement of a goal; they will be identified annually in SMART (specific, measurable, attainable, realistic, and timely) goals and business plans.

High Level Goals	Strategic Goals for the Biosolids Program
<b>Business Needs</b> Strategically manage a progressive, reliable, and cost-effective biosolids program.	<ul style="list-style-type: none"><li>• Maintain predictable product distribution</li><li>• Strengthen existing partner relationships</li><li>• Produce high quality biosolids products</li><li>• Reduce management costs over time</li><li>• Build public trust in products</li><li>• Strengthen product demand</li></ul>
<b>Global Stewardship</b> Minimize environmental impacts and maximize resource value of biosolids.	<ul style="list-style-type: none"><li>• Reduce greenhouse gas emissions</li><li>• Sequester carbon</li><li>• Build and enhance soils</li><li>• Retain and treat stormwater runoff</li></ul>
<b>Regulatory Compliance</b> Through continual improvement, meet or exceed all legal requirements.	<ul style="list-style-type: none"><li>• Monitor and report biosolids quality</li><li>• Improve product characteristics</li><li>• Ensure that all project sites and activities are in compliance</li></ul>

**Table 7. Strategic Goals for Biosolids Management**

The significance of each strategic goal is discussed in the sections that follow. Challenges and opportunities that can be foreseen over the next five years are also discussed, concluding with specific strategies and tactics to move WTD toward its ultimate goals.

#### 5.1.1 Predictable Product Distribution

**Maintain Diversity.** WTD has the advantage of a robust market for its biosolids among eastern Washington dryland wheat farmers. Although these areas of eastern Washington have more demand for bulk biosolids than WTD and other agencies can supply, WTD has followed the policy of maintaining a diversity of markets. For years, this diversity has been among agriculture, forestry, and compost but is now heavily weighted toward dryland wheat. This is the strongest market for King County biosolids but represents up to 70 percent of biosolids use. Additional diversity of end uses would bring more balance to the

program. But any changes need to be considered in the light of market strength, customer stability and sustainability.

**Strengthen Local Markets.** Local in-county markets for biosolids include forest users Hancock Forest Management and Washington State Department of Natural Resources and composter GroCo, Inc. While land management practices have changed over the past decade, the forestry market has remained stable (at about 20-25 percent of total biosolids production) since 1995. The compost market for biosolids, however, has been declining as compost sales have slumped in the slow economy. An added complication is that GroCo's owner is nearing retirement and King County is aware of no succession plan that will maintain the business and its contracts. To keep a compost made with King County biosolids in the Seattle area marketplace will require attracting a new compost partner or some creative business model involving WTD and GroCo. WTD strategy in the next few years will be double-pronged: (1) drive individual customer demand among urban gardeners for GroCo through the launch and promotion of King County biosolids as its major ingredient, and (2) evaluate the compost market more thoroughly, including options for new biosolids compost partners and products.

*During the next five years, WTD will seek to develop more uses for biosolids locally, while investigating other uses or technologies that could provide diversity or eventually substitute or supplement its land-based program.*

**Strengthen Existing Partner Relationships.** WTD's forestry program is structured around the 1995 Mountains to Sound Greenway Biosolids Forestry Agreement, a 5-member partnership involving the Greenway Trust, Washington State Department of Natural Resources, the Weyerhaeuser Company, King County WTD, and the University of Washington. (When Weyerhaeuser sold the Snoqualmie Tree Farm in 2003, the purchaser Hancock continued to participate in the biosolids program.) Since 1995, each organization in the partnership, including King County WTD, has had changes in key staff members and in top leadership. New landowners brought new forest management practices and implemented new rotation ages for timber cutting. In the near term, WTD biosolids staff will be working with State DNR and Hancock to provide information to those new to the program. Both the state and Hancock could benefit from bringing additional acres into the program by thinning, fertilizing with biosolids and adjusting rotation ages. A broader base of understanding and support internally with these partners can strengthen the forestry program over the next five years. In addition, product distribution can be better managed and improved through increased coordination with landowners' forest management plans.

Even in the agriculture projects, some founding farmers have retired; acres have changed hands, and there are newcomers to the long-standing biosolids operations. The Boulder Park project continues to grow and add new customers. The Natural Selection Farms project is diversifying from hops crops at application sites and moving into new crops and new farmers. In both existing agriculture projects, building a strong base of support and knowledge among the participants is essential and ongoing.

**Establish Temporary Storage Options.** As GroCo begins to move significant amounts of compost and keep sales momentum, they will become a more reliable user of WTD biosolids and provide more backup capacity for WTD. Forestry, although a local use, does not provide overnight storage. Since WTD lacks any significant storage for biosolids on the west side of the Cascades, program priorities must continue to be reliability, year-round availability, and flexibility in customer delivery sites. Customers and distribution centers that provide the most value to WTD are those that can reliably accept biosolids year-round.



Biosolids from a WTD treatment plant delivered to GroCo, Inc. for composting.

Customers often have multiple receiving locations that can be varied to accommodate winter hauling routes, schedules, and weather. Backup options are crucial, especially during the winter. WTD currently has contractual access to a storage site at the City of Everett Treatment Plant that provides temporary storage and mitigates the effect of winter pass closures. When the passes reopen, the stored biosolids is hauled to the Boulder Park project over Stevens Pass. Additional temporary storage on the westside of the Cascades and preferably along the I-90 corridor would be helpful.

**Evaluate New Technologies and Partners.** Although biosolids can be marketed and sold as a commodity, they must be managed carefully to comply with regulations and ensure community support. Biosolids are regulated through the end use site and King County is the permit holder. Vendors with little experience in handling biosolids or in representing biosolids to the public can be a risk to the county’s program, regulatory relationships, and reputation. Unlike other products, the supply of WTD biosolids is also limited and cannot be increased at will. WTD will investigate potential new markets, keeping in mind that any additional distribution channels take biosolids away from areas where costs are low and demand is highest.

During the next five years, WTD will seek to develop more uses for biosolids locally, maintain a predictable distribution of biosolids, while investigating other uses that could provide diversity or eventually substitute or supplement its land-based program.

Strategies
<ul style="list-style-type: none"> <li>• Use more biosolids locally in King County by building partnerships with composters to use King County biosolids as an ingredient.</li> <li>• Strengthen relationships with forestry partners/customers and coordinate forest management plans.</li> <li>• Diversify bulk King County biosolids project locations and customers, if supported by local third-party ambassadors and available supply of biosolids.</li> <li>• Continue partnerships with Beneficial Use Facilities (BUFs) that serve as regional distribution centers for biosolids from WTD and smaller agencies.</li> <li>• Regularly evaluate emerging biosolids technologies and pilot test as needed</li> <li>• Establish three levels of backup for distribution: (1) excess permitted acres, (2) temporary storage areas on westside and eastside, and (3) disposal options for non-standard or unmarketable material.</li> <li>• Maximize resource value of WTD biosolids, through biogas production and capture, soil building, reclamation, and carbon sequestration.</li> </ul>

## 5.1.2 Produce High Quality Products

Decades of research confirm that biosolids provide numerous benefits to soils and crops. Like any successful bulk biosolids product, King County biosolids has its long-time customers and advocates.

At the treatment plants, historically charged with waste stream management, the concept of product manufacturing and customer satisfaction is still somewhat new. While the production of a Class B biosolids is a routine part of plant operations, the nuanced differences in product quality, odor, consistency, moisture content—things that customers demand in a manufactured product—are not always understood. A series of national studies sponsored by the Water Environment Research Foundation (WERF) over the last several years has confirmed that objectionable odors in biosolids can be generated from anaerobic digestion followed by high-solids centrifuges—a combination of processes that WTD uses. University researchers have named this phenomenon ROSI: regrowth, odors, and sudden increase of pathogen-indicator organisms.

From the perspective of regulatory limits for trace metals, WTD biosolids already meet the highest federal and state standards. However, marketability of biosolids is usually determined by characteristics other than regulatory standards. Customers use bulk biosolids for its fertilizing and soil building properties, but its odor usually limits its use to large-scale remote sites, away from residences.

As WERF continues to conduct national trials seeking potential process solutions to ROSI, WTD will be field testing options with West Point Treatment Plant biosolids to assess product improvements.

The internal launch of the King County biosolids brand in early 2012 will help employees focus on the biosolids mission—*safely and sustainably returning carbon and nutrients to our land through the use of biosolids*—and the brand promise—*Safe. Works.* This simple promise becomes a powerful tool when every employee understands and commits to it. Embracing the brand and its promise can provide a springboard for increased quality control and concern for product quality.

### Strategies

- Unite Resource Recovery and Operations in an internal campaign to improve biosolids quality and internal pride in product.
- Collaborate with WERF and other national research efforts seeking practical methods to reduce biosolids product odors.



Nutrient-rich GroCo compost  
made with King County biosolids

### 5.1.3 Reduce Wastewater Management Costs Over Time

WTD's biosolids program has some of the state's lowest costs for land application, due to economies of scale from its large annual production of biosolids. Application and related support costs make up only 25 percent of the total budget. The biosolids program budget is dominated by transportation-to-market costs and the replacement costs for its fleet of haul trucks, for a combined total of 65 percent of the budget. Hauling costs are partially influenced by the distance that must be travelled to distribution centers; this makes the price of diesel fuel a notable variable in the annual budget. However, this land-based program is considerably lower priced than technology options such as drying or combustion, as revealed by vendor responses to the 2009 *Request for Information*. Diesel prices would have to increase by several-fold before land application would approach the cost of drying or energy processes.

A 2009 audit by the State Auditor's Office (SAO) stated that the revenue rate WTD was collecting from agricultural and forestry customers were below market rate. Customers pay WTD for the biosolids they receive, based on the nitrogen value of the biosolids; this fee ranges from \$1.50 to \$1.90 a wet ton (\$7.00 to \$7.20 a dry ton) or \$0.15 to \$0.19 a pound of nitrogen. At the time of the audit, this rate was about half the market rate for chemical nitrogen, which is tied to petroleum prices.

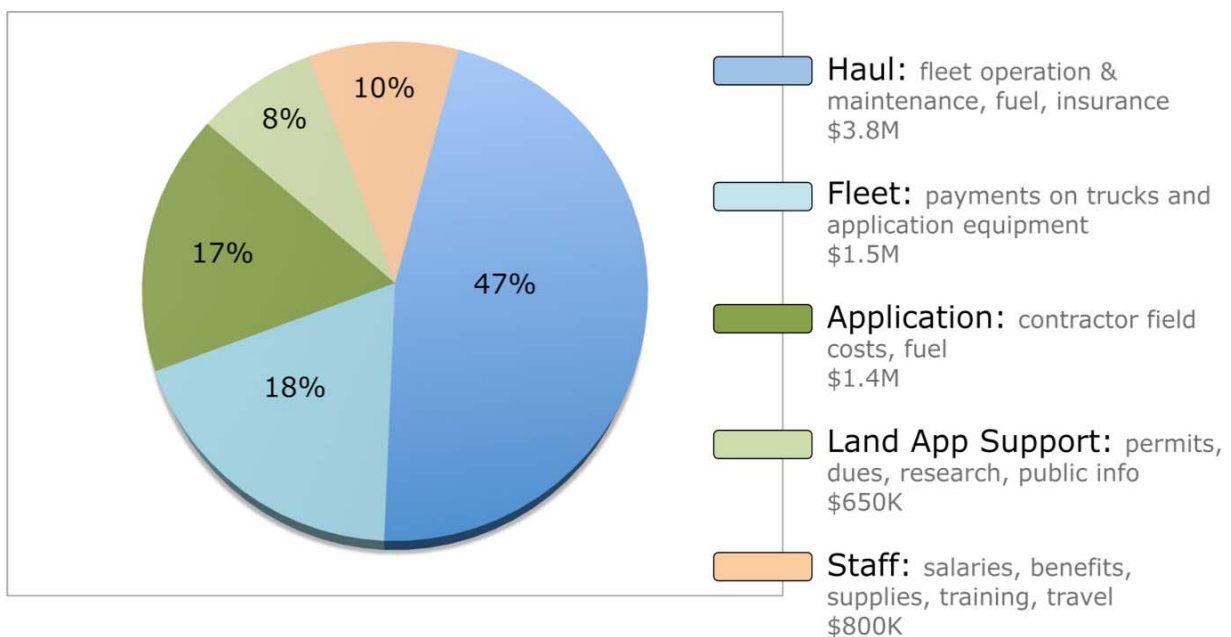


Figure 8. Biosolids Management Costs, 2011

Biosolids does not command the same price as chemical fertilizers in the marketplace for several reasons:

- Not as universally accepted (by farmers and neighbors) as chemical nitrogen
- Requires being on a waiting list
- Requires permitting, recordkeeping, and being a spokesperson at open houses

- Application rates of biosolids are regulated by Ecology so the farmer is not free to use as much as he wants
- Requires professional application and then tilling
- Requires year round acceptance of material – 12 trucks must leave the plants each day
- Customer must be “low risk”- as permitting and training on biosolids use is labor intensive, we need to be assured that there is the strong potential of a long term partnership

WTD was one of the first utilities in the nation to collect revenue from sales of biosolids. Even now, very few utilities accomplish this. Biosolids can be available from some application companies for no cost. This undercuts the projects and farm distributors that are providing biosolids for a fee. For these reasons, WTD is not able to charge market price of nitrogen for its biosolids. Still, WTD believes that the sale of biosolids and recognition of its value is important. Revenue will continue to be an important element of each customer contract. The total received annually from customers is between \$100,000 and \$150,000, which is about 2 percent of the program’s annual budget.

Strategies
<ul style="list-style-type: none"> <li>• Pursue uses and projects that can maintain WTD’s low costs for biosolids marketing and distribution. Maintain and expand a customer base to allow program lower transportation costs and diesel use.</li> <li>• Leverage improvements in biosolids quality and brand loyalty to maximize future revenue.</li> <li>• Work with researchers and partners to refine compost blends, allowing program to establish new anchor customers in growing westside markets (stormwater management and land reclamation).</li> </ul>

#### 5.1.4 Build Public Trust in Products

In 2010, an anti-biosolids group launched a campaign against the San Francisco Public Utilities Commission’s production and use of biosolids. Their campaign effectively shut down the utility’s biosolids compost giveaway program. Activists also engaged in a campaign against San Francisco’s mayor and environmentalist and organic food pioneer Alice Waters. Activists picketed Waters’ Chez Panisse restaurant and dumped biosolids on the steps of San Francisco City Hall. Across the US and on the internet, anti-biosolids activists became more vocal, even targeting University of Washington researcher Sally Brown at a national conference.

Although biosolids are used successfully and safely across the United States, biosolids generators and customers are usually ill-prepared to counter unsubstantiated anti-biosolids hysteria or misinformation and accusations about biosolids like the San Francisco situation. The fact is that biosolids are being branded negatively by activists who use words like *sludge*, *odors*, *toxic chemicals*, and *contamination*. Most people have little personal experience with biosolids products and so they do not have strong positive facts or feelings to counteract the claims that are pervasive on the Web.

Experiences across the US have shown that land application done right—protective of human and animal health, enhancing ecosystems and protecting water bodies—will not be

successful without public trust. Public trust can be earned in a number of ways: easy access and transparency of information, respected spokespersons, immaculate field operations, and frequent positive media. A strong, authentic product brand, associated with good results and shared values, can also be invaluable in establishing and maintaining public trust.

### Strategies

- Implement communication and marketing plan targeted at strategic business needs.
- Build a King County biosolids Web presence that is riveting, grounded in science and inspires trust in KC biosolids products.
- Maintain a proactive research/demonstration program with key universities
- Share biosolids "good news" with regional opinion influencers, community thought leaders, customers, partners and potential advocates and customers.
- Keep King County biosolids products at the forefront of local garden, food, and green news.
- Use educational/research partnerships and spokespersons to advance public understanding of the science and benefits of biosolids recycling.



Students on a field trip with educators from the Mountains to Sound Greenway Trust learn about soils and biosolids.

### 5.1.5 Strengthen Product Demand

While demand for King County biosolids has been steady or growing in Douglas County, the local compost market has slumped in the slow economy. Sales of GroCo made with King County biosolids have been slow, and the stockpiled product limits the value of GroCo as a delivery site during winter pass closures. Other potential local compost partners did not respond as expected to a 2009 Request for Proposals intended to bring in a new compost partner. With no new local partner and a GroCo owner nearing retirement, WTD strategy in the next few years will be to strengthen local demand for compost. This approach will be double-pronged: (1) drive individual customer demand among urban gardeners for GroCo through the launch and promotion of King County biosolids as its major ingredient, and (2) evaluate the compost market more thoroughly, including options for new biosolids compost partners and products.

There is growing interest among urban garden groups such as Alleycat Acres in using compost made with urban-derived, local recyclable products. Alleycat gardeners made a conscious choice to use a biosolids-based compost in their community gardens and have been instrumental in endorsing it among the gardening community.

The ability of biosolids to hold water in the soil like a sponge makes biosolids compost mixes a good choice for urban rain gardens. Many rain gardens are being planned in the Seattle area to reduce stormwater runoff. This is another potential local market for biosolids. See section 6.2.4 for more detail.

#### Strategies

- Establish biosolids compost with King County biosolids as the product of choice for urban and suburban gardens in King County.
- Promote science based approach and business case to customers reflecting both the environmental and yield benefits of biosolids application.
- Cultivate new markets for biosolids blends: land reclamation, rain gardens



Pumpkins growing in a garden amended with GroCo compost made from King County biosolids.

## 5.2 Global Stewardship

Cleaning wastewater to is an energy intensive process. As big consumers of energy, WTD takes care to conserve where we can. We also care about mitigating the impact of what we do use. Since the 1970s, WTD has been storing carbon in the soil with the biosolids created during the wastewater treatment process. As a natural soil amendment, rich in organic matter, and loaded with carbon, we reduce greenhouse gas emissions by returning that carbon to the soil and out of the atmosphere.

Global climate change and its far-reaching effects may be the most pervasive environmental challenge that our planet faces. King County has already established itself as a leader among the nation's local governments for its focused efforts to reduce greenhouse gas emissions and energy use in all its operations. With its biosolids, King County WTD has the ultimate environmental stewardship tool. By making wise choices in its use of biosolids, King County WTD can mitigate negative environmental impacts of energy use and increase environmental benefits. We can minimize losses of nitrogen and carbon to the air as pollutants and greenhouse gases. We can sequester carbon dioxide as organic carbon in soils and build soils through additions of organic matter and nutrients.

### Carbon Impact of King County Wastewater Treatment (2011)

MtCO<sub>2</sub>e – Metric Tons of Carbon Dioxide Equivalent



*\*Doesn't include indirect CO<sub>2</sub>e emissions associated with construction or purchasing*

Figure 9. Carbon Benefits from Loop Biosolids, 2011

### 5.2.1 Reduce Greenhouse Gas Emissions

Carbon accounting measures the amount of greenhouse gases (GHG) released or stored as a result of human activities, measured in terms of tons of carbon or tons of carbon dioxide (CO<sub>2</sub>) gas. Carbon accounting for biosolids management can be as straightforward as summing debits and credits of tons of CO<sub>2</sub>.

Biosolids management can have carbon credits for:

- Replacing synthetic fertilizers, which are energy intensive to make and release GHG
- Accumulating and sequestering soil carbon
- Replacing fossil fuels
- Displacing traditional materials in cement manufacturing

Debits are taken for:

- Burning diesel to transport biosolids from treatment plant to end use
- Burning diesel to land apply biosolids
- Using energy to dry biosolids
- Emitting nitrous oxide (N<sub>2</sub>O) gas, a potent GHG
- 

Carbon accounting performed by Dr. Sally Brown of the University of Washington on WTD's biosolids projects showed that all current projects have significant credits and only small debits from diesel burned for hauling and application. Since that analysis, she and her students have continued to refine the calculations by collecting field measurements from biosolids project areas on gas emissions. For more detailed discussion of carbon accounting for biosolids and wastewater, see Appendix B.

Over the next five year period, WTD will continue to work with UW and other science centers to refine our carbon accounting estimates and evaluate changes to operations that could further reduce emissions.

#### Strategies

- Use best available technology to minimize emissions from biosolids haul trucks and field application equipment.
- Minimize nitrous oxide emissions from biosolids land application.



WTD's new truck fleet is cleaner on the road. These trucks have only 5% of the NO<sub>x</sub> (nitrogen oxides) emissions of the previous fleet.

### 5.2.2 Sequester Carbon

Adding carbon in the form of organic matter to the soil is recognized as a cost-effective means to sequester carbon as well as produce a wide range of associated benefits (Brown, 2009). Terrestrial carbon storage is the third largest of the five global carbon pools, with the largest being the oceanic pool and the second largest being the geologic pool (Lal et al., 2003). Within this terrestrial pool, soil is an important storage zone: it has approximately three times the carbon contained in surface vegetation.

Use of biosolids and biosolids products has been shown to increase soil carbon concentrations. The carbon comes from the high percentage of organic matter in biosolids. Why are soil carbon and organic matter important? It is because carbon is being stored in the organic matter of the soil and is not free to move into the atmosphere as carbon dioxide, a greenhouse gas. So carbon storage or sequestration in the soil plays an important role in slowing climate change.

Research by universities in Washington and in other states and provinces has quantified carbon storage benefits associated with the use of organic amendments, including biosolids products from King County. If the U.S. government decides to take action in the future with a cap-and-trade or emission offsets program, then WTD needs to be positioned with verifiable information about the carbon storage potential of its projects. Under the Kyoto Protocols' Clean Development Mechanism (CDM), most of WTD's biosolids projects (dryland wheat and forest fertilization) did not qualify for carbon credits because those projects were in practice prior to 2000. To qualify for carbon markets under CDM, a biosolids carbon sequestration project needed to be a new storage mechanism. Reclamation of degraded sites or use of biosolids in agricultural no-till systems are two potential qualifying projects. Over the next five-year period, WTD will pursue research and demonstrations with soil reclamation and no-till cropping.

#### Strategies

- Through university research, document soil carbon storage from new uses of Loop, laying the groundwork for sale of credits in carbon markets.
- Promote use of compost with King County biosolids as a personal tool to store carbon in urban, suburban, and rural soils.



Soil scientists from the University of Washington measuring emissions of greenhouse gas nitrous oxide (N<sub>2</sub>O) at a land reclamation project on Vashon Island.

### 5.2.3 Build and Enhance Soils

Soils are one of the most overlooked and undervalued components in terrestrial ecosystems. But soil is responsible for sustaining life on earth: soils support biomass production that feeds humans, wildlife, and livestock. They regulate water flow, improve water quality, store and release essential nutrients, and maintain the balance of atmospheric gases. Soils are a complex biosphere that houses billions of organisms; one of their functions is to break down organic material and release nutrients to plant roots.

Organic matter is the not-so-secret ingredient in the soil that keeps soils healthy and functioning well. When native topsoils are stripped or severely disturbed, they lose the ability to soak up and retain water, to bind and degrade pollutants, and to support plants.

Adding organic matter back to disturbed soils can help restore their environmental function. Not surprisingly, biosolids are one of the best amendments to bring soils back to health. Not only do biosolids have high organic matter content, but they contain a full suite of nutrients to support newly established plant cover. Other organic or woody residuals can be mixed with biosolids to help create new topsoil with composted yard debris, food scraps, paper waste, and/or wood waste.

Scientists have suggested that the restoration of degraded soils to enhance their ability to hold carbon may be the one of the most effective actions that can be taken to mitigate the near-term effects of climate change.

In the 1970s and 80s, WTD provided biosolids to soil reclamation projects like the Centralia-area coal mine, with good success. To supplement the current program of agriculture, forestry, and composting, WTD will be exploring opportunities to combine its biosolids with residuals produced by other KC divisions into a restoration mix, then applying this mix to degraded lands owned by the County. In 2010, a cross-departmental team used GroCo and other mixes to begin restoration of an old borrow pit on Vashon Island. This was a first attempt to develop appropriate mixes and techniques for spreading and replanting. Further work needs to be done before the County has a successful prescription for restoration of native vegetation and forests. Large restoration projects could provide low cost, single-use only projects that can supplement and bring some diversity to the current biosolids program.

#### Strategies

- Demonstrate the use of King County biosolids to restore productivity to degraded soils; seek out additional demonstration sites among King County-owned properties that need restoration.
- Develop restoration soils mixes using King County biosolids and other county-generated residuals.
- Use King County biosolids to improve tilth and fertility of commercial agricultural soils.

## 5.2.4 Retain and Treat Stormwater Runoff

Impervious surfaces in urban areas produce large quantities of stormwater that usually have no access to natural soil where the flow could percolate naturally. Instead, these storm waters either feed into combined sewer systems or go directly into water bodies. Stormwater is a major source of contaminants—oil, chemicals, metals, sediments and other substances—that can be picked up from urban streets and carried along.

Bioretention systems are an alternative method of capturing stormwater and allowing it to infiltrate into soils. Vegetation in these systems can slow the rate of water flow. Specially designed soil mixes can clean the water of its contaminants and return water to natural subsurface flow paths. Composts are often used in bioretention soil mixes. Being high in organic matter, composts increase the water-holding capacity of the soil and encourage biological processes that can hold and degrade contaminants.

Biosolids have been proven to adsorb and bind metals and organic chemicals in contaminated soils. Other residuals like drinking water treatment residuals also can adsorb contaminants. A preliminary study in 2011 at the University of Washington demonstrated that a combination of GroCo biosolids compost, woody debris, and drinking water treatment residuals was effective at capturing and holding stormwater and removing contaminants.

Specially designed compost mixes for stormwater retention swales are a potential urban market for biosolids products. In 2012 and beyond, WTD will work with the UW to optimize bioretention soil blends for water infiltration and contaminant removal using biosolids and other municipal waste products.

### Strategies

- Work with university partners to develop custom biosolids compost mixes for research and demonstration of stormwater management.
- Work with other utilities to develop industry specifications for bioretention soil mixes that encourage the use of environmentally-effective recycled materials such as biosolids.



Field trials are used to test biosolids compost mixes and their suitability for various uses, such as soil reclamation and stormwater retention.

## **5.3 Regulatory Compliance**

### **5.3.1 Monitor and Report Biosolids Quality**

Because of WTD's effective Industrial Waste Program, metal contaminants in King County biosolids are very low. The county's goal is to produce the most contaminant-free biosolids practically achievable.

For several years, regulation of industrial waste dischargers has helped WTD meet its self-imposed goal of biosolids metals that are less than 20 percent of regulatory limits. For example, if selenium averages 7.0 parts per million (ppm) and the regulatory limit for land application is 100 ppm, then selenium is only 7 percent of the limit. This assures our customers that they are getting a very high quality biosolids. WTD's strategy will be to continue this vigilant approach to biosolids quality through the work of its Industrial Waste Program and to report biosolids quality annually to regulators and, through its website, to the general public. For more information, visit [www.kingcounty.gov/industrialwaste](http://www.kingcounty.gov/industrialwaste) and click "biosolids"

### **5.3.2 Improve Product Characteristics**

Washington State Department of Ecology modified the state biosolids rules in 2007, requiring all wastewater treatment facilities to screen incoming wastewater through a 3/8 inch or less screen. The rules also require biosolids to contain less than 1 percent by volume of inert materials such as plastic. South Treatment Plant's screens met the width requirement, but West Point's screens did not. A capital project has been under way to identify the best approach to replacing the screens and the processing trains for capturing screenings and grit. This project is on target for completion in 2014.

Digesters at West Point accumulate plastic and debris between cleanings. After the new influent screens are operative, digester cleanings will remove the historical levels of debris and the digesters can stay relatively free of debris, protected by the new screens. If the five digesters are cleaned on a schedule of one per year, it will take an additional five years to clean out the solids processing area of West Point. To avoid this lag time, Resource Recovery will work with West Point plant staff to evaluate options for expediting digester cleaning.

### **5.3.3 Ensure Compliance**

King County WTD will continue its goals to meet (or better) all regulatory standards for biosolids quality and management. The processes to produce biosolids and the content of biosolids are regulated by both federal and state rules. King County's biosolids easily meet Class B standards for use on a variety of food crops and other land-enhancement uses. The regulated metals in King County's biosolids are far less than the levels that have been determined to be safe for crops, humans, and the environment.

WTD strives not only for regulatory compliance but for excellence in its operating field projects. Since bulk biosolids are high in moisture and organic matter, their application to crops is more complex than applications of chemicals and requires specialized equipment. A near term strategy will be to develop and test a new forestry spreader that shows promise in improving the distribution of biosolids in forests of various ages.

## Strategies

- Improve biosolids quality by installation of influent screens at West Point.
- Expedite digester cleanings at West Point—after installation of influent screens—to remove accumulated debris.
- Keep regulated metals at 20% or below of the federal and state standards for the highest quality biosolids.
- Operate all projects in compliance with state regulations and best management practices and the highest possible field housekeeping.



Studies by scientists at the University of Washington and Washington State University have provided the basis for state and federal regulations and for best management practices.  
Pictured: Dr. Craig Cogger, soil scientist at Washington State University, Puyallup, WA.

## 6.0 Defining WTD's Biosolids Product: Key Benefits & Differentiators

Existing customers of King County biosolids know King County's product and what it will do for their soils and crops. They choose it over other soil amendments or fertilizers. But potential customers and the general public need to know precisely what biosolids is and why it is a safe and sustainable choice. Biosolids are easily distinguished from any other soil product—they have unique qualities that build soils and nourish plants. Described below are the characteristics that define biosolids and the benefits they provide. A successful land application and composting program requires clear definition of the benefits of using biosolids and differentiation between biosolids and competing fertilizing and soil conditioning products.

### 6.1 Soil Amendment Benefits

For more than 2000 years, humans have land applied many kinds of organic materials to improve the soil and grow better crops (O'Connor et al., 2005). These materials were sought after to add nutrients, to hold water, and to improve the physical condition of soil. In the twentieth century, treated wastewater solids became one of these land-applied organic materials. Their use triggered thousands of scientific studies conducted by government and university scientists over more than 40 years. Many of these studies confirmed the following basic mechanisms of biosolids behavior in soils.

**Enriches soil with plant-essential nutrients.** Plants need sixteen elements to grow and thrive. Biosolids provide them all. Primary (macro) nutrients—nitrogen, phosphorus, potassium—are needed by plants in the greatest total quantity. Secondary nutrients—calcium, magnesium, sulfur—are needed in lesser amounts than the primary nutrients. Micronutrients—boron, chlorine, copper, iron, manganese, molybdenum, zinc—are needed in very small amounts, but they play important roles in plant development and crop production. They are required for many plant functions such as transporting sugars and oxygen and forming enzymes, seeds, and chlorophyll. The remaining nutrients—carbon, hydrogen, oxygen—are found in organic compounds and end up forming the bulk of plant weight

Most commercial crops in the state of Washington are fertilized only with nitrogen. Growers rely on the soil to provide the other nutrients, because supplementation of secondary or micronutrients is prohibitively expensive. In some areas that have been cropped for more than three generations, soils are showing deficiencies of micronutrients such as zinc. When biosolids are substituted for commercial nitrogen fertilizers, all the macro- and micronutrients are supplied and replenish the soil.

**Builds and conditions soil.** Biosolids have a high concentration of organic matter, which is the result of decomposed organic materials. Organic matter, often referred to as humus, has been decomposed to such an extent that it is stable in the soil, resisting further breakdown. Organic matter causes soil to form clumps or aggregates, which give the soil a structure, making it more workable (increasing soil tilth) and allowing air, water, and roots to move through the soil easily. Biosolids organic matter can provide structure or improve the structure of both sandy and clay soils.

**Retains water in the soil.** The organic matter in biosolids holds water and nutrients in the soil, similar to the effects of peat moss. Organic matter can absorb and hold up to 90 percent of its weight in water (Funderburg, 2001). This sponge action holds water in the soil that is available to plants and helps them resist drought. Some unamended soils also

can hold water, such as clay soils, but this water is so tightly bound that it is unavailable to plants.

**Prevents wind and water erosion of soil.** Increasing soil organic matter by just 1 to 3 percent can reduce water erosion by up to one-third. Erosion is reduced because the improved soil structure allows water to flow into the soil rather than across it. Likewise, biosolids applied to powder-like dryland agricultural soils provide structure and aggregation, resulting in noticeable resistance to wind erosion.

**Makes superior compost.** Biosolids are highly compostable and can be successfully mixed with a variety of woody materials. Several physical and chemical characteristics make biosolids a desirable composting feedstock. Biosolids provide moisture, which is often needed in a compost mixture; it can also be a primary nitrogen source, especially when not enough green waste is available for composting.

**Stores carbon.** Because the organic matter in biosolids is composed of carbon-based compounds that are resistant to further degradation, this carbon is generally not available to be released to the atmosphere as carbon dioxide, a greenhouse gas. Recent studies demonstrate that biosolids carbon accumulates significantly in soils, even in agricultural fertilization projects with low application rates of biosolids.

**Ties up soil contaminants.** Again, organic matter in biosolids is the key to its beneficial functions and properties. Organic matter has many mechanisms for attracting and retaining metal ions like zinc, lead, cadmium, and arsenic. In areas where mining and smelting of these ores occurred, extensive areas of land have been contaminated and are devoid of vegetation. The addition of biosolids and wood ash can limit the availability of metals to plants, improve soil tilth, release nutrients, and encourage beneficial soil microbes. These changes allow the metal-contaminated soil to support and sustain plant growth again.



King County biosolids products contain the total suite of essential macronutrients and micronutrients that plants need for growth and reproduction.

## 6.2 What makes King County biosolids soil amendment different?

Biosolids add nutrients, which can also come from synthetic and chemical fertilizers, and biosolids add organic matter, which can also come from green manure, tilling in crops, and adding composted materials. Why are biosolids a more effective, more sustainable choice of soil amendment? There are 4 key reasons, which figure prominently in WTD's key messaging for the public and potential biosolids customers and partners.

- **Renewable resource** – Using biosolids returns harvested nutrients and carbon back to the land where they originated. This cycle of growing plants, consuming plants, releasing nutrients, recovering nutrients, and then replenishing the soil is endlessly renewable.
- **Higher nutrient value** – Biosolids provide a full suite of nutrients compared to common synthetic and chemical fertilizers, which often provide only 1 major nutrient. Adding other nutrients through fertilizers is prohibitively expensive for growers.
- **Protects Puget Sound** – Biosolids are recovered and treated at King County's wastewater treatment facilities, whose function is to clean wastewater before it is returned to Puget Sound. King County treats 175 million gallons a day of raw wastewater and produces up to 120,000 tons of biosolids each year to return to the soil.
- **Stores carbon** – University scientists have studied biosolids application areas and found significant accumulations of carbon stored in the soil (and unavailable for release to the atmosphere as greenhouse gas). In contrast, producing synthetic fertilizers uses great amounts of nonrenewable energy. By using a renewable resource like biosolids, growers are not only storing carbon in their soil, but they are avoiding the greenhouse gas emissions associated with synthetic fertilizers.



Wheat crops fertilized with biosolids in eastern Washington demonstrate that biosolids provide essential nutrients, improve soil tilth, prevent wind erosion, and store carbon.

## 7.0 Strategic Communications and Marketing

Our communications and marketing strategy provides an overall approach for sharing information about King County biosolids and WTD's Biosolids Program. It is the guide to supporting existing customers, reaching new customers, providing information to the general public and internal King County staff.

Specifically, the goals of this biosolids communications plan are to:

- Foster internal awareness and communications about King County biosolids products.
- Provide accurate, up-to-date information about safety and effectiveness of King County biosolids.
- Use consistent messages for internal and external communications.
- Develop and distribute clear, factual, branded information for use in public outreach, market development, educational programs, and for WTD staff and management.
- Identify information needs of interested parties such as the general public, customers, regulators, media, environmental groups, neighbors, and students.
- Network and collaborate with technology experts, treatment plant employees, biosolids managers and other organic recyclers to assess information needs.
- Earn trust and confidence from customers, regulators, and the general public.



King County Executive Dow Constantine  
with GroCo compost made with King  
County biosolids

In branding King County's biosolids (Section 7.2) we create a set of tools that will bring consistency to the county's communications and will help WTD accomplish its goals of strengthening its markets and building public trust. Consistent use of a King County biosolids brand and its message platform supports strategic business goals listed in the previous section.

WTD's overall marketing strategy is to build a brand that audiences and customers can relate to and care about. The attributes of King County biosolids and the reasons for using it resonate with many people in the Pacific Northwest.

As a region, we care deeply about our natural environment and sustaining it for future generations. The growth of the green industry demonstrates that people are interested in using products that conserve resources and lighten our environmental impacts. Our target customers will understand that the use of King County biosolids is consistent with these shared values.

## 7.1 Strategic Messaging and Positioning

Our goal in establishing a messaging platform and visual identity is to ensure biosolids product messages are clear, consistent, benefit-oriented, and written in language that our target audiences can understand and relate to. Establishing a consistent tone/voice is essential in building brand equity, the reputation and goodwill that a brand earns.

*The right brand can not only generate interest and “deepen our well” of community goodwill about our product, but it can communicate the agency’s values, its public promise, and reliability — what customers can count on when they use our product.*

Our biosolids communications strategy was designed to remain adaptable enough to flex and evolve as our business, competitors and marketplaces shift. In understanding our product and the positioning of King County biosolids in the marketplace (Section 5.0) we can keep key messages targeting the right audiences.

While we are implementing this strategy within our current business model, it has the ability to grow and scale up with us without losing its integrity if we partner in new ways in the future.

As a soil amendment, King County biosolids competes with manures, composts, and chemical fertilizers. There is not enough King County biosolids or even enough biosolids produced statewide to replace or significantly affect the market share of these competing products.

However, the county’s intention is to publicize and promote biosolids and its environmental benefits to potential users whose needs and environmental values align with those of the county.

### Target audiences

These are the individuals and groups who can use and benefit from King County biosolids soil amendment. They will be the primary focus of communications and customer service.

Internal:	Wastewater Treatment Division and other King County divisions and departments that use or produce organic materials
Customers:	Farmers, foresters, composters and land managers who would use King County biosolids in bulk. Homeowners and urban/suburban growers who would use retail products that contain Loop
Community:	General public and ratepayers, individuals, businesses, community leaders, stakeholders, and spokespersons
Partners/Peers:	Current and potential distribution partners, research scientists, other clean water utilities, and members of the Northwest Biosolids Management Association (NBMA) and other professional associations
Advocates:	Policy makers, political bodies, advocacy groups in King County and other jurisdictions where King County biosolids are used

## **7.2 Ready the Market: Develop a Brand for County Biosolids**

### **7.2.1 Why Brand Biosolids?**

Regardless of proven environmental benefits related to biosolids production and use, the development of a unique, positive image is essential to strengthen WTD's biosolids program and actively build loyal support and trust for our product (Section 5.1.4).

Our objective is to establish a King County biosolids brand to actively cultivate and increase community support and understanding of the County's biosolids product and correct misinformation about the safety and environmental benefits from biosolids. The right brand can not only generate interest and "deepen our well" of community goodwill about our product, but it can communicate the agency's values, its public promise, and reliability—what customers can count on when they use our product.

As anti-biosolids activists become more prevalent on a national stage (the internet), WTD will need a compelling message and following in support of local biosolids products.

A brand is not just a logo, color scheme or typeface. A brand is a collection of impressions, beliefs, perceptions, and expectations that people have about a product or organization. A biosolids brand must communicate what King County WTD stands for, what the public can expect from WTD, and what customers can count on when they use its biosolids product. Customers who have positive experience with a particular brand are not as affected by negative propaganda.

Strong, resonant product communications are a strategic tool to help move WTD forward and meet its long-term goals and vision. A brand and messaging platform will serve several essential business functions:

- Garner interest from new compost partners
- Align operations, strategies, and business plans
- Grow trusting relationships, both internal and external
- Create a common focus, direction, and culture for quality
- Differentiate King County biosolids from similar products
- Create value, both perceived and monetary
- Help clarify WTD values and mission for its ratepayers

In 2011, King County WTD worked with a consultant team (Kite Brand Studio and Somelab) specializing in brand development and identity, particularly with government agencies and their services. The steps involved in branding included:

1. Listening to customers' perspectives and opinions
2. Identifying the attributes of WTD that make it unique
3. Creating the distinct brand identity by synthesis of #1 and #2 above
4. Developing a plan to build and sustain the brand

WTD wanted to create a strong brand for its biosolids that was rooted in the truth. The brand had to be authentic and truly reflect WTD's values and the biosolids product itself. The process of branding was one of discovery and revealing attributes that were already there, not inventing. One-on-one interviews with external stakeholders and internal cross-functional staff provided opinions, beliefs, and common themes about WTD's biosolids and Biosolids Program.

### 7.2.2 Ingredient Brand Strategy

Stakeholder data helped determine that the most logical choice was to brand its current Class B biosolids using an ingredient brand strategy. Ingredient brands signal that a product has a valuable, well-known ingredient that provides value. For WTD's brand, the branded biosolids is the Class B cake, which is the valuable ingredient in GroCo and other biosolids composts. For large-scale land application, the branded Class B biosolids would be used alone.

If done correctly, the use of distinct communications tools in both western and eastern Washington markets can link WTD's markets and strengthen the entire biosolids program. For example, marketing success for King County biosolids as an ingredient in urban products can add to the authenticity of the brand name among rural farmer and forester customers. And brand loyalty among rural customers can be a selling point for urban biosolids products.

Stakeholder responses also helped shape the primary elements of the brand and messaging platform. See Appendix C.

### 7.2.3 Mission

The Biosolids Program's mission must be at the heart of a biosolids brand. It is both a strategic and a practical tool for aligning staff actions with goals. The mission provides a focus for all those involved in creating and managing biosolids:

*Safely and sustainably returning carbon and nutrients to  
our land through the use of biosolids.*

### 7.2.4 Promise

Our brand promise is the commitment that WTD makes and must deliver on. Its power and success come from being integrated throughout the utility and being understood and embraced by every employee. When a product delivers on its promise, brand loyalty is created. For WTD biosolids, our promise is simple and all-encompassing:

*Safe. Works.*

### 7.2.5 Descriptors and Differentiators

Stakeholder research was essential for defining the characteristics of our product and what separates King County biosolids from the pack of competitors (chemical landscaping products, fertilizers, manures, other biosolids products). The power of a strong communications platform is enhanced by defining exactly what kind of product it is, what it does, and why it is different from similar products.

What WTD's biosolids product is:

- Soil amendment

Its main benefits:

- Boosts plant growth
- Provides macro- and micro-nutrients
- Builds soil

What makes it different:

- Renewable resource
- Higher nutrient value
- Protects Puget Sound
- Stores carbon

## 7.2.6 Visual Identity

To develop a name and visual identity for King County biosolids, criteria were established that would tie directly to WTD's business strategy and needs.

**Effective & On Message** – Must emphasize core message, promise, and personality of the ingredient brand. (Note: brand specialists pushed the team to recognize that great brands play to their core customers, not every potential customer. A negative reaction by some, but strong positive reaction from the core following is often the brass ring of a strong brand.)

**Honest** – Anti-biosolids activists continue to assault biosolids branding activities as “poop-washing”. A name should be able to hold its ground and be authentic.

**Defensible** – No confusion for consumers; no similar mark already registered in federal trademark categories for soil amendments, topsoil, and education.

**Somewhat Edgy** – Without a large communications budget, WTD's biosolids communications strategy will rely significantly on word of mouth and viral communications. The name will need the potential to snowball.

**Sub-brand accord** – If partner organizations are to use WTD's brand on their product packaging and marketing materials, then it must not compete with their existing packaging and name but marry well and help them stand out in a crowded field.

**Verbal** – Is easy to talk about, rolls off the tongue in an elevator speech about the product or in casual conversation.



Figure 10. Loop Logo & Tagline

“Loop” emerged as a favorite with internal and external stakeholders because of the immediate association with recycling. It was easy to say, fun and upfront (in its similarity to “poop”), and most important, this simple name worked well with messages and as an ingredient for retail compost products.

The graphic or “mark” is characterized by a friendly lower case font. The infinity symbol represents the recycling loop for the endlessly renewable resource of biosolids, and the colors represent lush green crops and blue skies.

The tag line, “Turn your dirt around,” is a short, easy distillation of one of the brand’s key messages. It’s a snappy reminder that Loop soil amendment can bring soil back to life with its nutrients and organic matter. It makes plants and soils thrive. This short fun phrase is easily remembered and understood by customers, from urban gardeners to large-scale commercial farmers.

King County is applying for a federal trademark status for the Loop™ logo and tag line. WTD will use the Loop™ trademark for its Class B biosolids and as an ingredient in GroCo compost and any future commercial products.

### **7.2.7 Living the Brand**

Simply having a memorable brand does not guarantee success in marketing. Building and sustaining the brand requires consistency and focus on the attributes behind the brand, such as keeping the emphasis on safety and quality of the product, choosing partners who understand and speak for the product, and choosing projects that enhance the environment and take advantage of Loop’s unique qualities. Everything WTD does in the production and use of its biosolids product either strengthens or weakens the Loop™ brand. The more WTD does to consistently communicate the brand, the more it will contribute to the success of our mission and vision.

## 7.3 Different Audiences, Different Needs



Dr. Sally Brown, University of Washington soil scientist, and GroCo compost made with Loop

Community support is essential to the success of any biosolids recycling program. Not only do customers and their neighbors need information, but the general public must understand the safety and benefits of biosolids use and appreciate it as essential for a sustainable society. The key to working with communities, especially those outside the county, is to find credible, respected spokespersons who are knowledgeable about biosolids science and operations and willing to talk about it. In farming communities, the best spokespersons are usually the farmers who are receiving biosolids and seeing results.

Equally as important as local spokespersons is the opportunity for touring biosolids project areas. Prepared public information documents can provide supplementary information, but they do not substitute for seeing the real thing. On farm and forest tours, neighbors and prospective customers see biosolids unloaded from the truck, spread with field equipment, and crops growing with and without biosolids. It's the right setting for frank conversation about the benefits of using biosolids as a soil amendment or fertilizer. Having a university scientist or extension specialist who is knowledgeable about biosolids and the local crops can be invaluable. It's important that community members know who to contact with additional questions after the tour is over.

In more urban areas of King County, spokespersons may be King County communication specialists, Master Gardeners, university scientists or students, or representatives from gardening, environmental, or conservation organizations such as the Mountains to Sound Greenway Trust or Islandwood. Seeing the results from using biosolids compost can be important but is not as effective as trying the compost for themselves. Samples of the compost for the potential customer to try at home are popular and effective with urban/suburban gardeners.

Regardless of the setting—farm community, forest or urban garden—a knowledgeable spokesperson is key to communicating WTD's messages. Spokespersons may be referred to as gatekeepers (of public opinion), third-party ambassadors, advocates, or thought leaders. They are essential to getting the word out about biosolids and building public trust.

King County's objective is to use the Loop brand and messaging to actively cultivate and increase community support and understanding of the County's biosolids product and correct any misinformation about the safety and environmental benefits from biosolids. In this way we hope to generate interest and "deepen our well" of community goodwill about our public promise, reliability, and the results that customers can count on when they use our product.

Listed below are the specific actions that WTD staff will take to provide information about biosolids and market Loop to target audiences:

	Audience Description	Communications Objectives
<b>Internal King County</b>	Staff and managers in WTD, at the King County Environmental Lab, and in other divisions where organic materials are produced or managed, such as the Parks Department, Water and Land Division.	<ul style="list-style-type: none"> <li>• Cultivate product pride of manufacturing &amp; quality assurance.</li> <li>• King County employees lend credibility to product as knowledgeable supporters.</li> </ul>
<b>Existing Land Application Customers</b>	Farmers, foresters, composters and land managers who would use King County biosolids in bulk.	<ul style="list-style-type: none"> <li>• Strengthen product demand. Continue to garner support around environmental benefit and yields to increase demand for Loop.</li> <li>• Support customer business needs.</li> <li>• Maintain positive communication flow.</li> <li>• Establish toolkit for consistent and compelling communications.</li> </ul>
<b>Future Customers &amp; Advocates</b>	Homeowners and urban/suburban growers who would use retail products that contain Loop. Potential future large scale compost partners or land application customers. Policy makers, political bodies, advocacy groups in King County and other jurisdictions where King County biosolids is used.	<ul style="list-style-type: none"> <li>• Deepen well of goodwill.</li> <li>• Generate excitement for product.</li> <li>• Secure endorsements.</li> <li>• Grow Loop brand equity and support.</li> </ul>
<b>General Community</b>	General public, current and future ratepayers, individuals, businesses, community leaders, stakeholders, and spokespersons.	<ul style="list-style-type: none"> <li>• Educate about product and nutrient cycle.</li> <li>• Establish Loop brand and benefits awareness. Reinforce recycling ethic.</li> <li>• Inspire the next generation of clean water scientists, utility workers and engineers.</li> </ul>
<b>Partners/Peers</b>	Current and potential distribution partners, research scientists, other clean water utilities, and members of the Northwest Biosolids Management Association (NBMA) and other professional associations.	<ul style="list-style-type: none"> <li>• Collaborate and lead to further biosolids industry.</li> <li>• Professional, reputable testimonials</li> <li>• Establish robust &amp; resilient partners able to withstand/correct misinformation and anti-biosolids attacks.</li> <li>• Establish toolkit for consistent and compelling communications.</li> </ul>

### 7.3.1 Internal Audiences: *Build Support and Pride in Product*

A successful product brand begins inside an organization, with a focus and commitment from all employees. Product quality can be dependent on manufacturing standards and the skills and care of the people who make the product. When WTD employees completely understand the value of the product they are making and the appreciation of its customers, then pride in product grows. Quality control tightens and Operations and Marketing work more closely together. The brand creates a common focus, direction, and culture for quality. As employees become more knowledgeable and supportive of Loop, they strengthen and build credibility for the entire biosolids program.

The primary purpose for WTD internal communications is to disseminate accurate information about biosolids, the new Loop™ brand, and to build pride in our product.

#### Internal WTD Audience: Approach

- Inform employees about the new biosolids product brand, unveiling the brand name, logo, tagline, website, truck graphics, key messages, and how it fits into our current partnership with GroCo.
- Explain to employees the branding methods used in arriving at the final brand concept, including how their ideas and name suggestions informed the process.
- Engage employees with the public launch of Loop™ at the Northwest Flower & Garden show.
- Engage employees about the importance of WTD's biosolids branding efforts, including:
  - How it supports future partnerships as an ingredient in composts like GroCo
  - How other clean water agencies have branded their products
  - How branding helps inform the public about the work we do
  - How it can maintain and grow public support for our programs, products, and services
  - How branding positively impacts WTD's mission to create resources from wastewater
  - How it helps create brand loyalty that can negate misinformation spread by opposition groups.
- Create easy to use tools for building WTD-wide staff support for Loop and consistent use of its branding key messages.

#### Internal WTD Audience: Tactics

- After the internal launch of the brand, internal communications will support and reinforce key messages and information about how Loop is being produced and managed. Listed below are the tactics for internal communication.
  - Provide WTD staff with information on Loop and how it is produced and managed, through use of the following tools:
    - ✓ Loop posters, displayed where Operations & Maintenance staff are likely to see and read them
    - ✓ Articles (Watermark and Director's Digest) and division-wide e-mails about Loop
    - ✓ References to the new Loop partnership website on WiRE and other communications; website will contain key messages and FAQs.
- Integrate Resource Recovery and Operations staff with a shared pride in product.
  - Participate in planning teams and cross-sectional operational teams such as the Solids team
  - Lead field tours of biosolids use sites for as many WTD staff as possible, particularly operators

- o Coordinate field trips for community relations staff and Brightwater Education Center staff who will act as spokespersons
  - o Use small branded items that have a “shelf life” such as pens, sticky notes and caps to allow employees to gain a daily familiarity with the brand. Make other branded wear available for purchase at online store.
- Coordinate with other King County staff who need information about biosolids.
  - o Share information with soils/organics staff in the Solid Waste Division, Parks Division, and Road Services Division on respective programs, including education, outreach, current events, research and regulations.
  - o Work with other division representatives to develop King County organic mixes for land reclamation.




### Key Messages Specific to Internal WTD/WLRD Audiences

- The success and strength of this new brand depends on you! Your input was critical in the research and development of Loop. WTD operations and biosolids staff have already given our biosolids a great reputation built on a quality product. The success of Loop now depends on WTD employees, including operations, biosolids, community relations staff, as well as management.
- Loop will help us increase public awareness and support of our agency, our services and products—not only with our ratepayers—but also with current and potential future biosolids customers. We can use the Loop brand to increase community support and understand of our biosolids, as well as promote their safety, reliability, and environmental benefits.
- We make great biosolids! We make Loop™! Thanks to WTD employees, we already had a reputation for producing safe, quality biosolids. In essence, we were already building our brand. Now, with Loop, we can capitalize on that great reputation and better communicate to people what biosolids are, who we are, and why what we do is important.
- Many clean water agencies that treat wastewater have a biosolids product with an official name and brand. Examples include: City of Tacoma’s TAGRO, Pierce County’s SoundGRO, City of Milwaukee’s Milorganite, City of Austin’s Dillo Dirt, Hampton Roads’ (VA) Nutri-Green.
- Promoting our biosolids fits WTD’s vision to *Create Resources from Wastewater*. It shows that we are doing an outstanding job of acting as stewards of the environment and resources provided by the ratepayer.

### 7.3.2 Existing Biosolids Customers: *Strengthen Demand and Support Customer Needs*

Existing customers already know the benefits of using biosolids. Their loyalty to the Loop brand will grow if they have good experiences with King County and its biosolids. Land application customers are looking for increased crop yields, enhanced soils, and data that documents these improvements to their lands. They also need information that they can share with neighbors and employees, and often, they want help from King County WTD in working with external agencies.

For customers with large organizations, support for the produce can often be isolated to the project managers who work daily with our team. As we move forward, we must build support with all levels of our customer's organizational structure. Concerns must be addressed at all levels of the organization, instead of limiting the information about biosolids to the particular employees and project managers who work directly with King County. Our approach will be to provide existing customers with tools that help them build support for *why biosolids use help them meet their unique business needs* and thereby strengthen demand and brand loyalty.

Project Name	Landowner	Uses/ Crops	County	Tons	% of Total	Est. Future Demand
1. Boulder Park	Various	Dryland wheat	Douglas	68,000	57.1%	
2. Natural Selection Farms	Various	Canola, hops	Yakima	20,000	16.8%	
3. Snoqualmie Forest	Hancock Forest Management	Commercial forests	King	25,000	21.0%	?
4. Marckworth Forest	WA State DNR	Commercial forests	King	5,000	4.2%	?
5. GroCo Compost	GroCo Inc.	Retail compost	King	1,500	0.8%	

Figures are approximate. See Table 1, Section 2.2 for full table

#### Existing Customers: Approach

- Ensure that information for existing customers is science-based, compelling, and supplemented with relevant local/national research results.
- Maintain routine, positive communications with customers; we will be attentive and supportive.
- Reassure customers that King County stands behind the quality of Loop and has absolute confidence in its benefits for the customers' lands and crops.

#### Existing Customers: Tactics

- Develop internal communication toolkit that is suitable for both customer's staff and executive management and can integrate Loop into all levels of the organization.
- Develop external communication toolkit that customers can use for their public information needs.
- Conduct field tours to share information with customers, including managers, staff, and stakeholders.
- Sponsor long-term monitoring and growth studies on customer's crops and land to document improvements from biosolids use.

- Provide customers with access to relevant research and biosolids quality data at [www.kingcounty.gov/biosolids](http://www.kingcounty.gov/biosolids). As the manufacturer of Loop, King County can provide detailed information on its website to support customer needs. The URL [www.kingcounty.gov/loop](http://www.kingcounty.gov/loop) will forward directly to the Loop partners website at [www.LoopForYourSoil.com](http://www.LoopForYourSoil.com). Since the branding process was a collaborative effort between several partners who either advocate for, research, manufacture, distribute, manage, and/or use Loop, their website will not be housed on the King County domain as it would cause confusion about the partnership, particularly for the Eastern Washington agricultural partners who distribute and manage the application of Loop.

### **7.3.3 Future Customers and Advocates: *Deepen Well of Goodwill and Generate Excitement***

The Loop brand has already demonstrated that it has the ability to catch people’s attention and make them want to know more. King County can capitalize on the inherent friendly “coolness” of its new visual identity to generate excitement among potential users and spokespersons. Beyond the memorable and easily recognizable Loop mark, King County will need to communicate its environmental values and what users can expect from using its soil amendment product. Brand equity, or the value of the brand, grows when people have positive associations with the product, either through direct personal experience or perceived quality and attributes. The power of the brand grows from the goodwill of customers and what they have experienced and learned about the brand. This translates into resilience for the brand’s reputation and value whenever it is maligned.

Interest in biosolids as a soil amendment and crop fertilizer is high right now in several counties. There are not enough biosolids produced in the state to satisfy all the growers who want to use it, although in some areas, local permitting hoops and pockets of public resistance are preventing more widespread use of biosolids. These situations call for small demonstration plots—the results invariably create local biosolids advocates, sponsors, and spokespersons.

#### **Future Customers and Advocates: Approach**

- Keep a Loop presence on the World Wide Web and use social media to generate continual airtime and visibility for Loop.
- Correct blatant misinformation in a confident, friendly manner, with well-documented facts.
- Seek opportunities to install demonstration plots with new growers, new crops
- Increase the value of the brand (brand equity) by providing potential customers with name recognition, powerful information about environmental benefits, and opportunities to try the product.

#### **Future Customers and Advocates: Tactics**

- Inventory and evaluate existing public information: brochures, fact sheets, posters, and other materials. Update with Loop brand identifiers and key messages.
- Establish Loop external website at [www.LoopForYourSoil.com](http://www.LoopForYourSoil.com) as a product-oriented website designed for and managed by several partner organizations that make the Loop biosolids product and distribution possible. These partners include NBMA members involved with Loop: Boulder Park Inc., Natural Selection Farms, GroCo, Skagit Transportation, King County, and others. The focus will be on Loop, Loop partners, and Loop products—where to buy them, how to use them, and what they will do for your plants and soils.
- Maintain King County website with current information about WTD’s biosolids program as part of the Resource Recovery website. More detailed information about the

program can be found here. Link to the Loop partners' web site, which will be more product-oriented.

- Keep Loop prominently featured in web communications such as King County blog, Resource Recovery blog, Facebook posts, tweets, Flickr pages, including any new and popular websites or applications likely to reach target audiences.
- Provide individual, specific responses to requests for information.
  - Make initial response within 48 hours to inquiries from citizens or to responses sent on behalf of the King County Executive.
  - Track and document all requests for information and responses; determine which public information materials are most useful or if others are needed.
  - Conduct field tours of Loop project sites for interested parties.
- Promptly provide information to members of King County Council as needed or requested.
  - Respond within 48 hours to inquiries from Council members, their staff, or to citizen requests.
  - Participate in Council and/or committee briefings as requested.



Eastern Washington farm managers giving tours of their biosolids-fertilized fields.

### 7.3.4 Community Audience: *Educate and Inspire*

Customers and potential customers of Loop and products made with Loop are a subset of the general population. Not everyone has the need for a bulk soil amendment. But everyone in King County is a sewer ratepayer—either through direct sewer connections or cleaning of their septic tanks. And they have the right to know and understand what happens with their fees and who benefits. Just as WTD employees can have pride in manufacturing Loop, the general public can and should feel pride in the clean water and recycled products produced in this region. They are part of a sustainable system to keep our environment clean and healthy.

WTD’s approach will be to increase awareness through its Loop brand and to provide general education about the carbon and nutrient cycles associated with biosolids. Along the way, we hope to inspire the next generation of clean water scientists, utility workers and engineers.

#### Community: Approach

- Provide general information about wastewater treatment, biosolids recycling, and the Loop product at selected public events—those that attract our target audiences or have event themes aligned with WTD’s mission and vision.
- Conduct tours and presentations specifically for communities near biosolids project sites, including landowners, researchers, and local spokespersons.

#### Community: Tactics

- Look for earned media, social media, and viral marketing opportunities to highlight the benefits of returning carbon and nutrients to the land through biosolids use.
- Establish a Loop traveling show, with booth, photography, public information, and compost samples. Attend fairs, gardening and agricultural events to promote Loop™ and Loop™ products, distribute samples and “how to use” information, and answer questions.
- Support environmental education programs: Brightwater Education Center, IslandWood, Mountains to Sound Greenway Trust (MTSGT) for K-12 classes; act as technical resource for Greenway educators. MTSGT focuses its education activities in the areas where WTD biosolids is used in King County. They are an invaluable third-party ambassador for Loop and GroCo, teaching specific modules on use of biosolids in the forest and the importance of soil health.



Students on a Mountains to Sound Greenway field trip learn about the role of biosolids in forests close to Seattle.

- Engage elected officials, garden clubs, industry, agricultural and environmental leaders through presentations and one-on-one meetings.
- Work with WTD Community Relations staff to provide tools and support for presentations and tours with school groups.
- Give tours of project sites and treatment plants; host open houses at project sites for neighbors, regulators, environmental organizations, media, and other interested parties. Ensure local spokespersons and university researchers participate in the tours to provide perspective and first-hand information about their experiences with Loop.

### **7.3.5 Partners and Peers: *Collaborate and Lead***

King County WTD is one of the most well-known clean water utilities in the region. WTD produces more biosolids than any utility in the Washington, Oregon, and Idaho region. Other reasons for high visibility are that biosolids staff are active in the Northwest Biosolids Management Association, and WTD is a partner in the largest land application facility in Washington, the Boulder Park project. With prominence comes responsibility. Landowners, communities, and regulators all expect high quality products and projects from King County WTD.

King County's approach to communicating with its partners and peers is to maintain and communicate high standards and a passion for continuing education and research. Understanding the behavior of biosolids in soils is essential for safe, effective, and sustainable land application of biosolids.

#### **Partners & Peers: Approach**

- Provide regional access to information on research and best management practices to encourage highest standards for biosolids management.
- In collaboration with other clean water agencies and research organizations, develop toolkit with consistent and compelling messages for use throughout region.

#### **Partners & Peers: Tactics**

- Continue active participation in Northwest Biosolids Management Association.
  - WTD biosolids staff will serve on Board of Directors, Information & Education committee, Research & Demonstration committee, Regulatory Development committee, and Continual Improvement Systems committee to represent King County and ensure that the NBMA's work provides good value to King County.
  - Assist in the development of NBMA fact sheets, Q&As about biosolids, and research bulletins.
  - Set up workshops with university researchers to disseminate latest research results.
  - Make presentations at meetings and annual conferences.
- Support and publicize results of university research and monitoring of land application and composting. Publicize research results through inter/intranet pages, technical journals, other industry publications, public information documents and presentations.
- Collaborate and network with other clean water utilities and research organizations on national level to ensure access to current research results and opportunities to participate in national studies, leveraging King County's own research efforts.

## 8.0 Looking Forward: Turning Plan to Action

Consistent with standard business practices and the results of the 2009 audit of the biosolids program by the State Auditor's Office, the biosolids program's annual goals will be SMART— specific, measurable, attainable, realistic and timely. Specific goals and objectives will be developed annually for WTD's Business Plan. As seen in the sections below, goals and work plans are more definitive for the early years of this five year plan.

### 8.1 Focus By Year

Certain goals will be a staple of the program every year:

#### **DISTRIBUTION: Maintain predictable product distribution**

- Distribute to customers 100% of the production of biosolids that meet regulatory standards.
- Achieve biosolids fleet safety record better than the regional average.
- Continue partnerships with Beneficial Use Facilities (BUFs) that are cost-effective and serve as regional distribution centers for biosolids from WTD and smaller agencies.
- Maintain agreements for 3 levels of backup: (1) excess permitted acres, (2) temporary storage areas on westside and eastside, and (3) disposal options for non-standard or unmarketable material.
- Promote use of compost made with Loop as a personal tool to store carbon in urban, suburban, and rural soils.
- Use more Loop locally by (1) building partnerships to market compost made with Loop in King County; (2) use compost made with Loop in local high-profile projects; (3) sponsor compost giveaways and demonstration projects.

#### **QUALITY: Produce (and improve upon) a high quality biosolids**

- Keep regulated metals at 20% or below of the federal and state standards for the highest quality biosolids.
- Operate all projects in compliance with state regulations and best management practices and the highest possible field housekeeping.
- Ensure that use sites are in compliance with permit conditions.

#### **LOYALTY: Build public trust in products**

- Share biosolids "good news" with regional opinion influencers, thought leaders, and potential advocates.
- Unite Resource Recovery and WTD Operations in an internal campaign to improve biosolids quality and internal pride in product.
- Keep Loop products at the forefront of local garden, food, and green news.
- Promote biosolids compost with King County biosolids as the product of choice for urban and suburban gardens in King County.
- Sponsor university research to address public or regulatory questions.

#### **FUTURE MARKETS: Strengthen product demand**

- Regularly evaluate emerging biosolids technologies and pilot test as needed.
- Maximize resource value of King County biosolids, through biogas production and capture, soil building, reclamation, and carbon sequestration.
- Pursue partners and projects that can maintain WTD's low costs for marketing and distribution and diversify suite of appropriate land application sites.
- Use educational/research partnerships and spokespersons to advance public understanding of biosolids recycling.

## Work Plan Focus - 2012

### **DISTRIBUTION: Maintain predictable product distribution**

- Truck fleet end of life: replace 20 units of the biosolids truck fleet with new models that will minimize emissions and increase reliability.
- Renew agreements with smaller agencies who use the Boulder Park Beneficial Use Facility (BUF) and institute the new fee for King County support and application equipment.
- Develop 5-year plan for applications to Snoqualmie and Marckworth Forests; coordinate with landowner forest management plans.
- Find opportunities to highlight existing customers as leaders in strong environmental stewardship to strengthen customer relationships.

### **QUALITY: Produce (and improve upon) a high quality biosolids product**

- Launch Loop brand internally in Q1 2012 and begin campaign to unite Resource Recovery and Operations in an internal campaign to improve biosolids quality and internal pride in product.
- Seek collaboration with WERF and other national research efforts seeking practical methods to reduce biosolids product odors.
- Re-evaluate and implement new field housekeeping practices.

### **LOYALTY: Build public trust in products**

- Establish a Loop partners Web presence by Q2 2012 that is riveting, grounded in science and inspires trust in KC biosolids products.
- Launch the Loop brand externally at the PNW Flower & Garden Show and as outdoor advertising on biosolids fleet
- Reaffirm educational/research partnerships and spokespersons to advance public understanding of biosolids recycling. Cultivate community leaders as Loop ambassadors

### **FUTURE MARKETS: Strengthen product demand**

- Complete work with a local university business program to evaluate the regional compost market and options for composting and distribution.
- Work with university partners to develop custom biosolids compost mixes for stage 2 of research and demonstration of stormwater management.
- Reconvene the cross-departmental carbon sequestration team to evaluate sites and materials for a second demonstration project.
- By Q3 2012, issue a compost RFP to solicit new partners in compost and organics recycling field

## Work Plan Focus - 2013 and 2014

### **DISTRIBUTION: Maintain predictable product distribution**

- Truck fleet end of life: complete replacement of truck fleet to minimize emissions and increase reliability.
- Evaluate possible sites for relocating Georgetown Truck Maintenance Facility to a location east of Seattle, in response to federal mandates for shortening driver hours.
- By end of 2013, conduct second 10-year review of the Mountains to Sound Greenway Biosolids Forestry Agreement with partners University of Washington, Greenway Trust, and Washington State Department of Natural Resources.

### **QUALITY: Produce (and improve upon) a high quality biosolids product**

- Improve biosolids quality by installation of new influent screens at West Point by late 2014.
- Expedite digester cleanings at West Point—after installation of influent screens—to remove accumulated debris.

### **LOYALTY: Build public trust in products**

- Leverage improvements in biosolids quality (from new influent screens) and brand loyalty to maximize future revenue.

- 
- Implement initial social media/viral marketing campaign about Loop benefits
  - Establish community leaders as Loop ambassadors.

**FUTURE MARKETS: Strengthen product demand**

- Cultivate new markets for biosolids blends: land reclamation, rain gardens, green stormwater infrastructure.
- Find suitable site among King County-owned properties and install a second field demonstration of carbon sequestration and land reclamation, using various blends of Loop and other county-generated residuals.
  - Evaluate operational techniques and estimate cost of full-scale projects
  - Monitor success of various blends by measuring tree survival, carbon storage, and greenhouse gas emissions.

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**Work Plan Focus - 2015 and 2016**

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**DISTRIBUTION: Maintain predictable product distribution**

- Onboard new compost and land application customers seamlessly into distribution pattern (target customers are stable, high volume, easy access, low cost, winter reliability)

**QUALITY: Produce (and improve upon) a high quality biosolids product**

- Evaluate implementation of WERF-recommended process modifications to reduce biosolids odors.

**LOYALTY: Build public trust in products**

- Reassess program's carbon footprint for 2016 suite of projects, using data developed from site-specific university studies.

**FUTURE MARKETS: Strengthen product demand**

- Q4, determine process for next period of market evaluation and planning. Including comprehensive review of existing project life expectancies and status of new technologies.
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On-farm research and demonstration: a young canola crop grown with biosolids at Natural Selection Farms, Yakima County.

## 8.2 Continual Evaluation of Emerging Technologies

Technology changes rapidly. To ensure that WTD stays current, its Technology Assessment program evaluates wastewater and biosolids technologies and pilot-tests those that show promise. As the division moves forward with a land application and composting program for biosolids over the next 5 years, it will be important to balance the existing investment in assets, partnerships, and programs with potential new approaches. This strategy allows WTD to evaluate the effectiveness of its treatment and management systems without putting 30 years of history, customers, and assets at unnecessary risk.

The Technology Assessment team evaluates wastewater and biosolids technologies to assess the applicability of the technology to our wastewater system and whether the technology has the potential to save money, improve treatment performance, or recover valuable resources.

Specifically, the preliminary evaluation process considers the following criteria:

1. Level of technology development
2. Applicability to wastewater system/King County facilities
3. Potential benefits to wastewater/King County facilities or the environment
4. Potential impacts to wastewater/King County facilities or the environment
5. Potential to recover or improve marketability of valuable resources
6. Consistency with King County policies and directives

In 2005, King County WTD and its consultants, Brown and Caldwell, evaluated potential technologies for producing a Class A biosolids at West Point and South Treatment Plants. The resulting report is a work plan that could be implemented if and when WTD decided to produce Class A biosolids rather than the current Class B product. A crucial question for this study was: what events might trigger the need to implement Class A? Those triggers are listed here as examples of events that might cause WTD to consider a significant change of direction in its biosolids program for the long term.

- Does a market exist for a Class A product in Western Washington for a significant fraction of King County biosolids (>10%) that is less costly than the current Eastern Washington Class B program?
- Are regulation changes anticipated that would require use of a Class A product or make use of a Class B product much more restrictive and costly?
- Is there a substantial high risk of Class B product market controversy that could result in loss of one or more current large customers in a short period of time?
- Is there a political driver to use more biosolids in Western Washington?
- Is there a long-term risk of large market losses or shifts that justify developing a local Class A market to provide diversity and therefore higher reliability to the biosolids market program even at higher cost?
- Are there potential technical issues with Class B use that could put current markets at risk (e.g. regrowth of pathogens)?
- Can digester capacity be increased by implementing a Class A program at West Point?
- Will implementation of the Class A program maintain or add diversity to the County's market product options?

In the absence of any of these trigger events, WTD will continue to identify and evaluate new and emerging technologies as they evolve beyond the nascent stage and demonstrate potential for the division's biosolids business needs. Based on these evaluations, WTD is participating in a Water Environment Research Foundation (WERF) pilot study investigating combining organic wastes such as food waste or restaurant grease with wastewater solids ("co-digestion") to enhance biogas production. We are also continuing to track the progress of promising technologies such as biomass gasification, bio-char production and thermal hydrolysis.

WTD's Technology Assessment Program allows our biosolids team to build on the knowledge established in the 2008 Request for Information (Section 4.0) and learn about options for supplementing, strengthening, or diversifying its biosolids program. Based on the criteria listed above, solids management technologies recently evaluated by our team include:

Biosolids Technology	Description	Status
Co-Digestion of Organics	Import organic waste (food waste, grease, etc.) and mix with ww solids to enhance digester biogas production for energy recovery.	WTD participating in Water Environment Research Foundation (WERF) pilot study.
Andritz Direct Heat Dryer	Biosolids drying to produce Class A product	Full-scale applications in US. Continue to track technology.
EcoWave Drying	Combination of microwave + infrared heat drying to produce Class A product	No operating units. Appear to be out of business. No contact since 2010.
EnerTech	Renewable biofuel - SlurryCarb process. Product to co-combustion with coal	Bid on the 2009 RFI (4.1.1). Require use of 100% biosolids produced, eliminating current customers. Unproven. Struggling with startup operations in only full-scale facility.
Polaris	Renewable biofuel - Waste heat biosolids drying to co-combustion with coal	Bid on the 2009 RFI (4.1.1). Require use of 100% biosolids produced, eliminating current customers. Unproven. No known full-scale operations.
Waste Recovery Seattle International (WRSI)	Co-incineration of biosolids with municipal solid waste	Vendor indicated that biosolids would be accepted as revenue source, limited to small portion of incinerator capacity to prevent detrimental impact on energy production. Would require biosolids drying process. Incinerator was not sited in area.
Nexterra	Upflow biomass gasification system. Produces biogas for energy recovery.	Full-scale applications using wood waste material. No wastewater solids applications. Continue to track development.

Hydrothermal Carbonization - GreenTech Avenue (GTA)	Application of heat and d pressure to produce bio-char for energy production.	No known operating GTA units. Continue to track technology development.
Exelys	Continuous plug flow thermal hydrolysis - increase biogas, energy production, reduce biosolids.	Would require significant onsite process modifications. Continue to track development.
GreenScene Pelletization	Drying/pelletization.	No wastewater solids application. Focus on agricultural bedding.
Wetzel Oil - Sewage-to-Fuel	Convert ww solids to biodiesel fuel.	Preliminary technology discussions ongoing.

**Table 8. Emerging Solids Management Technologies Recently Evaluated by WTD**

Digestion test facility operated by WTD's Technology Assessment Program



## 9.0 Human Resource Management

### 9.1 Succession Planning

Succession planning and staffing became an issue for the biosolids program between 2009 and 2011. After decades of stability, turnover within our partner organizations and our WTD biosolids team increased dramatically. Within our program, unexpected staffing changes and retirements were both a hurdle and an opportunity, allowing us to more clearly define our needs, retool, retrain, and rebuild with the skill sets we believe will be needed in successfully implementing this plan.

WTD's Resource Recovery programs, including the Biosolids Program, continue to attract "green innovators" who want careers on the leading edge of environmental entrepreneurship and innovation. With our future program and utility needs in mind, the biosolids program has recruited and hired in all new vacancies with an eye towards skills that allow for cross-training, teamwork, communications, accountability and future leadership capabilities.

New hires not only have technical backgrounds in science, engineering or project management fields, but also communications and outreach experience critical for effectively interpreting technical information to non-technical audiences simply, clearly and concisely. Each team member must be able to articulate a compelling and inspired vision and sense of core purpose about the work of the utility and the biosolids program.

As a small, nimble team with significant business, safety, regulatory and public accountability requirements, each staff member must have a demonstrated ability to work with colleagues, vendors, customers and the public to find creative solutions, identify and evaluate "out of the box" alternatives for complex problems, and learn new skills critical for the program's success. Building and managing business systems that allow for transparency and accountability drive day-to-day efforts and individual work plans.

As noted in the 2012-2013 utility-wide WTD annual business plan, succession planning continues to be an important strategy for WTD to maintain experienced staffing levels in both its capital and operating programs. Twenty one percent of WTD's current staff are eligible to retire in the next five years, with 48 percent eligible by 2023.

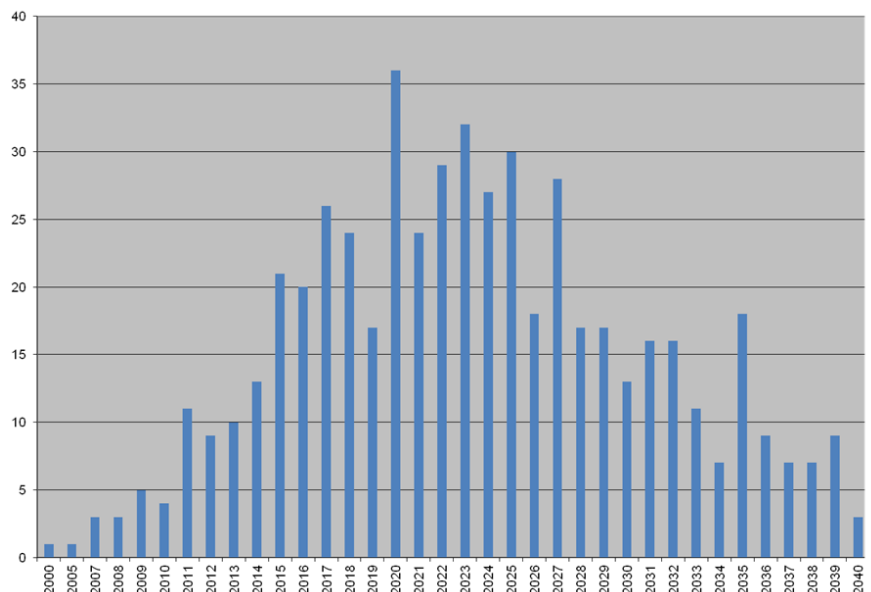


Figure 1. Number of WTD Employee Eligible for Retirement by Year

Similar to national trends, the division's workforce is now comprised of four generations working together, with a fifth joining the workforce soon. This provides an opportunity to capitalize on the variety of viewpoints, work styles and preferences of the different generations but requires careful supervisory and management training to effectively manage this diversity in the workplace. WTD is emphasizing accountability, high expectations for supervisors, and clear communication of performance and behavior standards.

## 9.2 Staffing

The nature of the biosolids supply/value chain (see Figure 4) extends the number of individuals who create and manage biosolids and who are considered part of WTD's biosolids management team.

The Biosolids Program falls under the Resource Recovery section of the utility, which also includes reclaimed water, renewable energy, energy efficiency, research and technology assessment programs. The Resource Recovery section of WTD is tasked with ensuring safe, trustworthy products are made from the beneficial re-use of an urban renewable waste stream. In recovering resources from wastewater, we reduce reliance on discharging effluent to Puget Sound and reduce overall utility costs while providing environmental benefits including carbon and water resources management. As a public, rate-backed utility, WTD is required to complete its mission while running a predictable, financially stable business for our rate payers.

The core biosolids team in the Resource Recovery section of WTD is responsible for marketing the product, managing its distribution, providing customer service, and ensuring regulatory compliance at field projects. They interact on a daily basis with solids supervisors at all three plants, who oversee the daily production of Loop™ and loading into haul trucks. As noted in Figure 4, the Industrial Waste program supervisor and staff are on the front end of the supply chain, ensuring that industrial dischargers meet their regulated limits.

Communications staff, particularly those located in the WTD Director's Office are also influential in getting the key messages about Loop out to all staff. Four groups—core biosolids team, Industrial Waste, plant staff, and communications staff—are the key influencers of Loop™ product quality and customer service.

Position	Location	Primary Responsibilities
<b>Core Team</b>		
Program Manager/Supervisor	Resource Recovery: Biosolids Team	Oversee biosolids operating and capital activities. Ensure annual work plans and long-term plans are carried out.
Program Lead	Resource Recovery: Biosolids Team	Works with project managers to guide daily operations. Coordinates university research program. Oversees permitting, monitoring, and reporting to meet regulatory requirements.
Transportation Project Manager	Resource Recovery: Biosolids Team	Manages biosolids hauling and deliveries by coordination with treatment plants and haul contractor. Manages biosolids fleet capital budget.
Communications Project Manager	Resource Recovery: Biosolids Team	Carries out communications plans, consistent with Loop brand platform. Develops technical and biosolids monitoring reports.
Forestry Project Manager	Resource Recovery:	Works with forestry customers and

	Biosolids Team	oversees field operations and construction (permitting, application, monitoring, and recordkeeping). Manages forestry capital equipment budget.
Agriculture Project Manager	Resource Recovery: Biosolids Team	Oversees all aspects of eastern Washington agricultural projects (permitting, application, monitoring, and recordkeeping). Manages agriculture capital equipment budget.
Stormwater Project Manager	Resource Recovery: Biosolids Team	Coordinates all activities relating to industrial stormwater permit at biosolids truck maintenance facility. Maintains Stormwater Pollution Prevention Plan.
Extended Team		
Solids Supervisor	West Point Treatment Plant	Oversees biosolids digestion and dewatering. Coordinates solids processing with plant processes and operations. Communicates needs of WP to Biosolids Project Managers and hauler.
Solids Supervisor	South Treatment Plant	Oversees the biosolids production and hauling coordination for South Plant. Leads crew of Operators & Master Mechanic to produce site-specific biosolids. Coordinates efforts with plant process and operations. Communicates needs of SP to Biosolids Project Managers and hauler.
Process Analyst – Solids	Brightwater Treatment Plant	Optimizes thickening and dewatering operations. Monitors biologic treatment in anaerobic digesters. Coordinates biosolids hauling with Biosolids team and hauler.
Supervisor and Staff	Industrial Waste Program	Oversees all aspects of the regulation of industrial and commercial facilities discharging wastewater into King County's system in order to protect the environment, public health, biosolids quality, and regional sewerage system.
WTD Internal Communications Specialist	WTD Director's Office	Supports internal communication plan and efforts, consistent with Loop branding platform. Helps develop and/or distribute internal Loop messages via organization newsletters, emails, intranet, etc.
WTD Media Relations Specialist	WTD Director's Office	Develops and oversee external communication plans consistent with Loop branding platform. Manages media contact and coordinate interviews with key agency spokespeople.
Community Relations Specialists	Environmental Compliance and Community Services	Shares information about WTD with public, conduct treatment plant tours for adults and schoolchildren
Technology Assessment Lead	Resource Recovery Section: Technology Assessment Team	Evaluates and pilot-tests emerging technologies

**Table 9. Extended WTD Staffing for Biosolids Supply/Value Chain, 2012**

## 10.0 Collaboration & Partnerships

In working with other utilities on projects and issues, we strengthen not only King County's biosolids program but biosolids recycling throughout the region. Prior to 1987, each wastewater utility went its own way in figuring out how to manage its biosolids and what practices were appropriate under the federal law at that time. Not surprisingly, land use controversies involving biosolids were common, and one agency's failure to secure a project site usually affected other agencies.

Today, strong partnerships across the region are designed to efficiently support our program's business needs and product distribution.

*Partners and active friends of King County's biosolids program include:*

**Other King County agencies** | King County WTD works with other King County divisions on projects related to land management and carbon sequestration, fleet management, the management of organic residuals (woody and clean green waste streams) and stormwater management.

**Boulder Park, Inc.** | Boulder Park, Inc. partners with King County WTD to manage a Beneficial Use Facility in rural eastern Washington for the application of biosolids to dryland wheat. Many other wastewater utilities contribute biosolids to this project, expanding the number of farmers who are able to receive and use biosolids. Thanks to Boulder Park, Inc., many farmers and landowners have already reaped the benefits of Loop. Boulder Park is a farmer-owned company managing the distribution and use of Loop in Douglas County. Since 1991, farmers who've amended their soil with Loop have increased crop yields, decreased fertilizer costs, reduced erosion, stored carbon, and helped replenish the soil for thousands of acres of dryland grain crops.

**Natural Selection Farms, Inc.** | Natural Selection Farms, Inc. is a third generation family farming operation on the southern side of Snipes Mountain in Yakima County, WA. They believe holistic farm management practices should be used to promote crop growth and maintain harmony with nature. Natural Selection Farms has been committed to returning carbon and nutrients in biosolids to soils since 1980. Their use of Loop has reduced the use of synthetic fertilizers and pesticides on thousands of acres of canola, hops, alfalfa, wheat, orchards and managed rangeland.

**Hancock Forest Management** | Hancock's Snoqualmie Forest has been fertilized with Loop since 1987. Every year, Loop supplies about 1,000 acres of timberlands with nitrogen and other essential nutrients to help trees grow. Loop substitutes for commercial fertilizers while enhancing soils and wildlife habitat.

**Washington State Department of Natural Resources** | Loop is used to improve soils and fertilize trees in state forests in King County, primarily in Marckworth Forest near Duvall. King County partnered with DNR in 1995 as part of the Mountains to Sound Greenway biosolids forestry program. Loop helps store carbon in wood and forest soils.

**Alleycat Acres** | Alleycat Acres is a Seattle-based urban farming collective that converts vacant lots into community-run farms. By farming the cityscape Alleycat Acres is addressing a number of issues facing our communities. Members of the collective agree that it makes sense to use GroCo compost made with Loop to condition and fertilize city dirt into fertile soil. Not only does GroCo help them grow nutritious fruits and vegetables, Alleycat Acres is doing their part to close the nutrient loop.

**Seattle University** | As part of the Sustainable Urban Agriculture Program, Seattle University students and faculty have transformed an unused area of the treatment plant's grounds into a teaching farm. They also manage a demonstration garden at the South Treatment Plant in Renton. These projects showcase the benefits of using GroCo compost made with Loop in sustainable farming. The program educates students and citizens about growing food locally. They have partnered with local agencies to contribute nutritious produce to neighboring communities.

**GroCo, Inc.** | GroCo, Inc. has been recycling carbon and nutrients by composting Loop with sawdust since 1976. GroCo made with Loop is composted for over a year resulting in a mature, clean, weed- and pathogen-free soil amendment that looks and smells earthy, much like a forest floor. GroCo is ideal for use in residential and commercial landscaping, home vegetable gardens, and soil restoration.

**Northwest Biosolids Management Association** | The NBMA is a cooperative of public wastewater agencies, sewer districts, and private companies in Washington, Oregon, Idaho, Alaska, and British Columbia. NBMA's mission is to advance environmental sustainability through the beneficial use of biosolids. With the support of its members, NBMA provides continuing education and networking opportunities, produces publications, reviews biosolids regulations and funds university involvement and research.

**Mountains to Sound Greenway Trust** | The Mountains to Sound Greenway connects natural areas, trails, working farms and forests, historic towns and communities, wildlife habitat and recreation opportunities from Seattle across the Cascade Mountains to Central Washington. The Mountains to Sound Greenway Trust facilitated an agreement between King County and private and public forestland owners to use Loop to fertilize and preserve Greenway forests, as well as restore degraded natural lands. The Trust provides outdoor science education—featuring Loop and GroCo compost—for forest field study trips to students.

**IslandWood** | Founded in 1999, IslandWood is a nationally recognized outdoor education center connecting thousands of children and adults every year to the natural world in communities throughout the Puget Sound region. IslandWood's mission is to provide exceptional learning experiences and to inspire lifelong environmental and community stewardship. The partnership between King County's Brightwater Center and IslandWood provides new and enhanced educational programs for area students, teachers, and community members. The partnership enables the expansion of educational programs currently offered at the Brightwater Center to students in the third through eighth grades, including teacher trainings, adult workshops, family programs, and summer camps.

*King County depends on scientific scrutiny from reputable research institutions. Loop continues to be evaluated in research studies conducted by the following institutions:*

**Washington State University: Department of Crops and Soils** | This program focuses on building soil productivity, supporting local agriculture, protecting water quality, and facilitating recycling of organic wastes by applying soil science principles to agricultural, development, and waste management issues. Among other scientists, Craig Cogger and Andy Bary from the WSU Puyallup research and extension center have been instrumental in studying the land application of Loop. Their recent work has examined Loop as a fertilizer replacement, as an ingredient in potting mixes and low impact development rain garden soil mixes, and soil carbon sequestration.

**University of Washington: School of Environmental and Forest Sciences** | Decades of research on Loop by UW scientists has given us an understanding of the safety and benefits of its use in the forest environment. Their research has also been used to define best management practices, including composting. Studies have included tree growth, soil enhancement, and reclamation of degraded lands, as well as environmental effects like water quality, wildlife response, and carbon sequestration. Scientists like Sally Brown and Chuck Henry have been national leaders in researching forestry application, land application, composts, and soil carbon sequestration of biosolids, including Loop.

**Water & Environmental Technology Center** | Supported by the National Science Foundation, the WET Center is an association of Temple University, the University of Arizona, and Arizona State University. The Center studies water quality, emerging contaminants, and technology for water and wastewater treatment. Prominent scientists at these universities, like Drs. Ian Pepper and Chuck Gerba, evaluate the potential effects of chemicals and microorganisms in biosolids and on land. Their work puts King County on the leading edge of biosolids management and helps to keep Loop safe and effective.



A tour of WSU's dryland wheat research plots at the Boulder Park Project with representatives from Washington wastewater utilities. These utilities provide biosolids to Boulder Park farmers.

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